125

GAS JOURNAL

LIGHT . HEAT . POWER . BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. 202. 85th Year. LONDON, APRIL 19, 1933. No. 3648. Price 1s.

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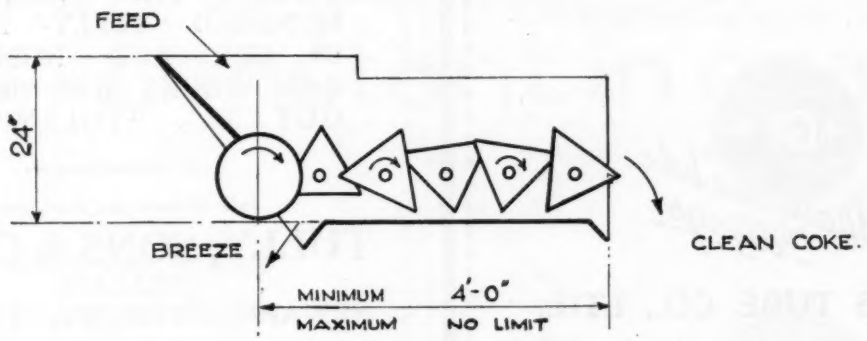

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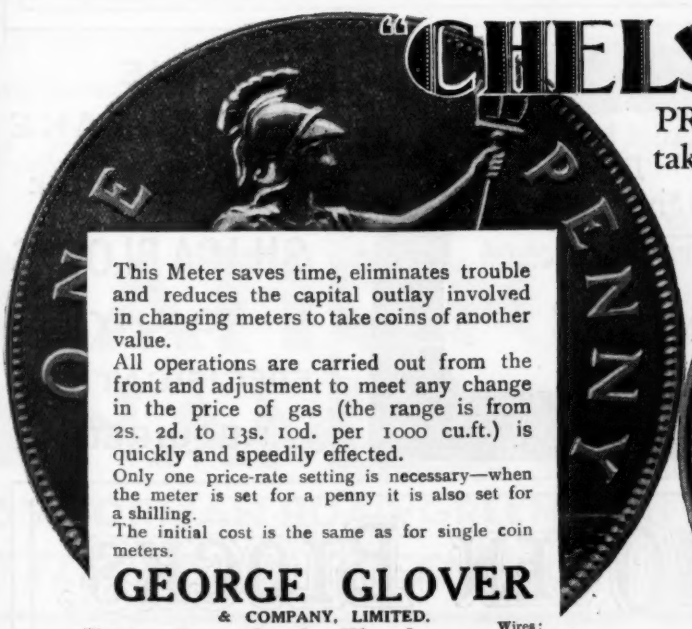
takes PENNIES and SHILLINGS



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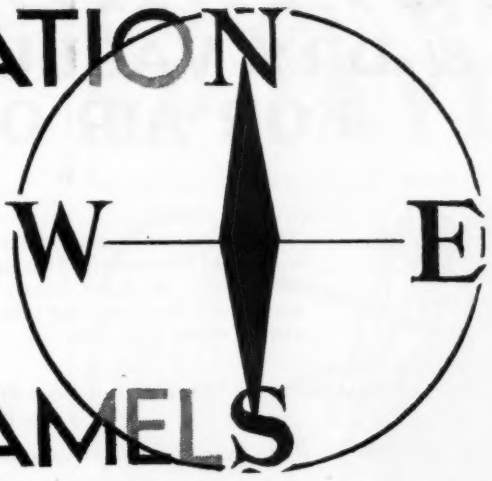

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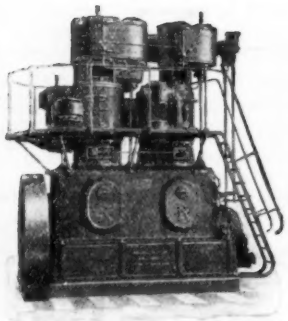

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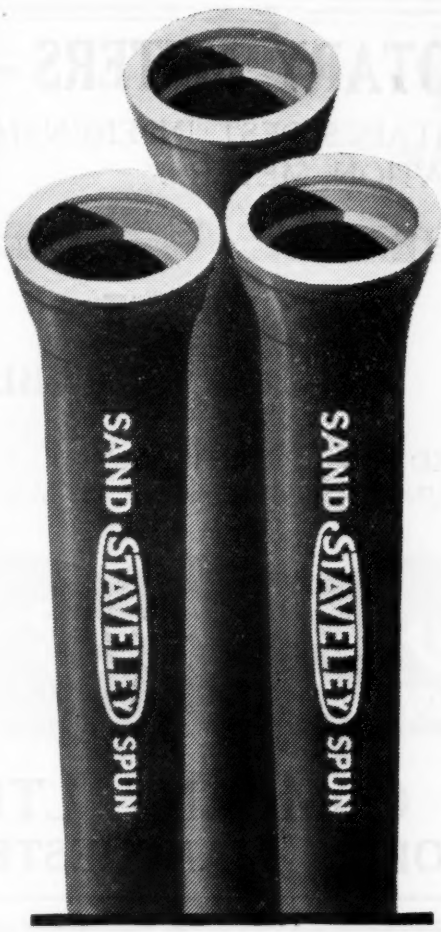

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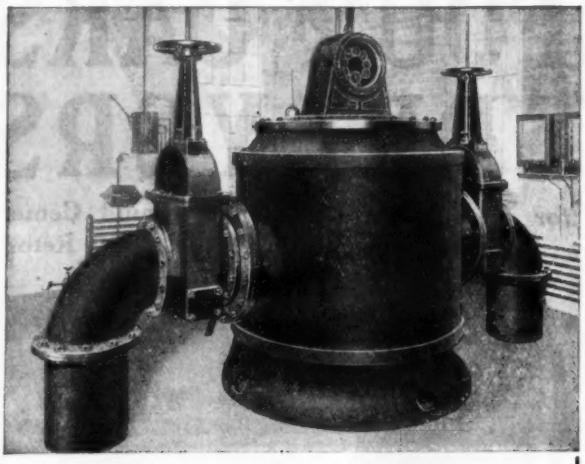

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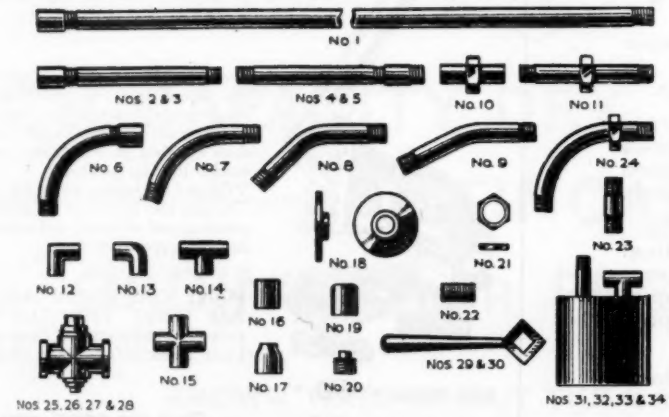

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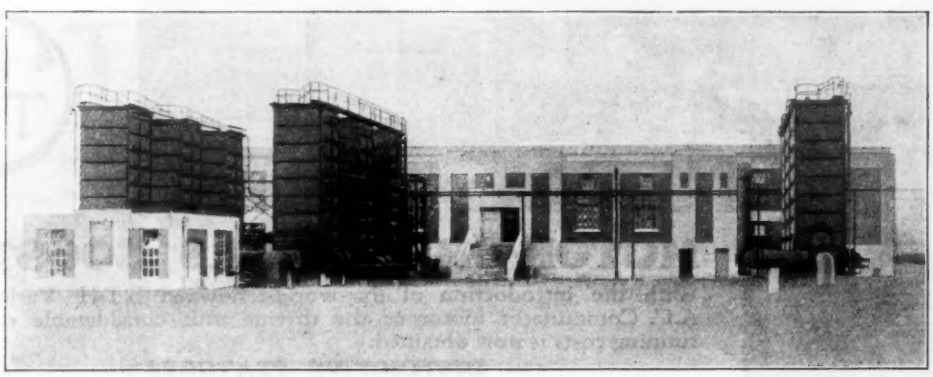

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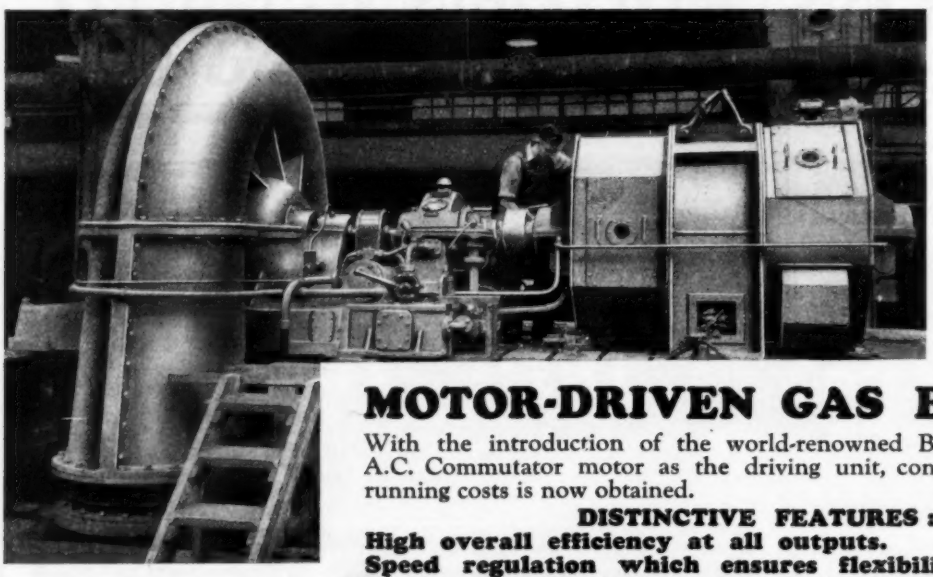

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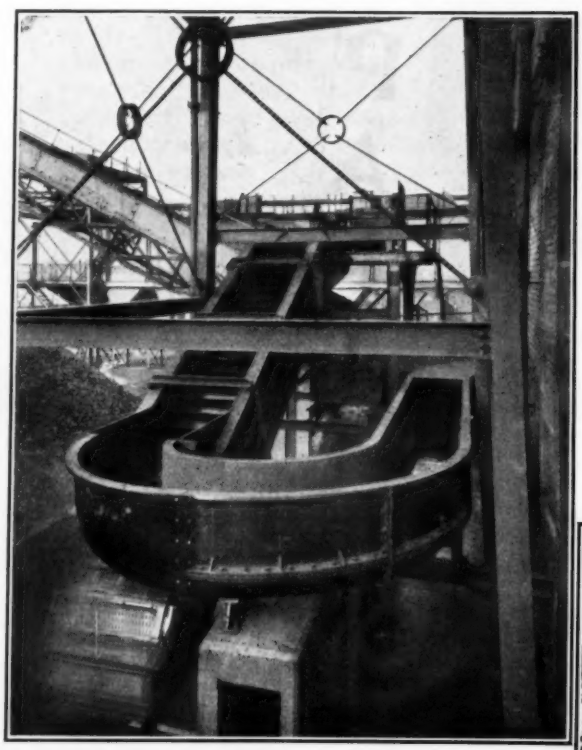

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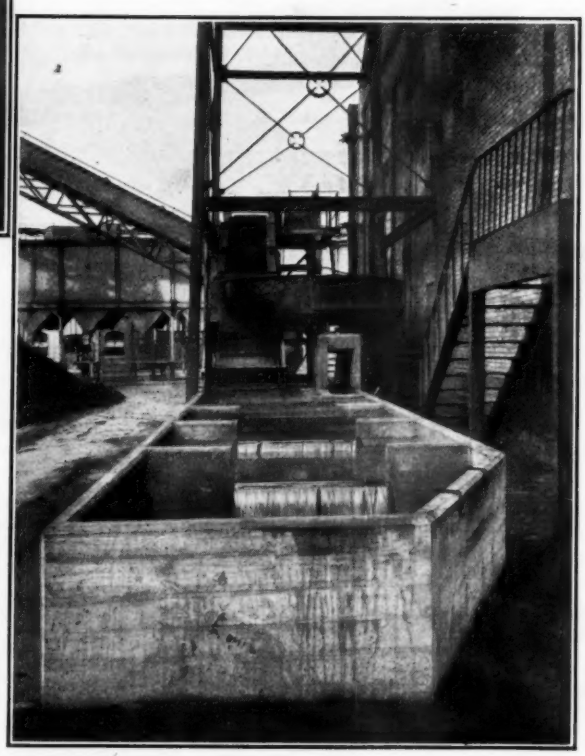

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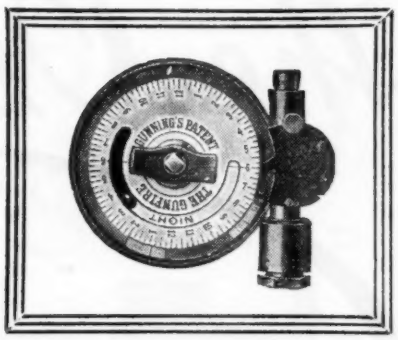

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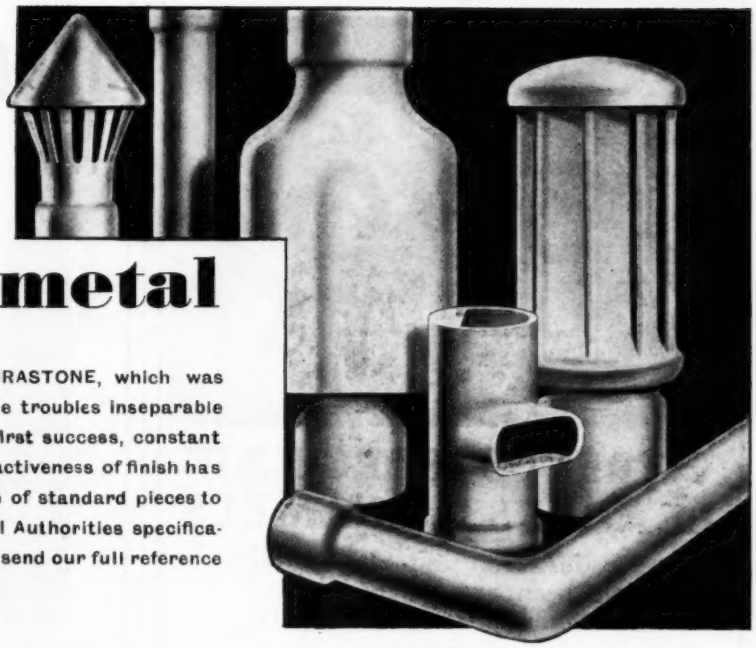

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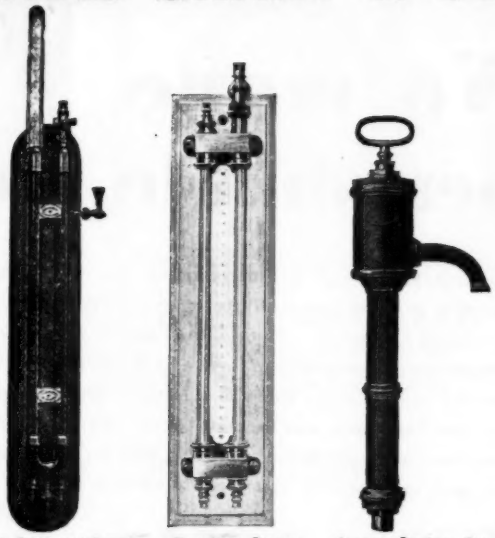

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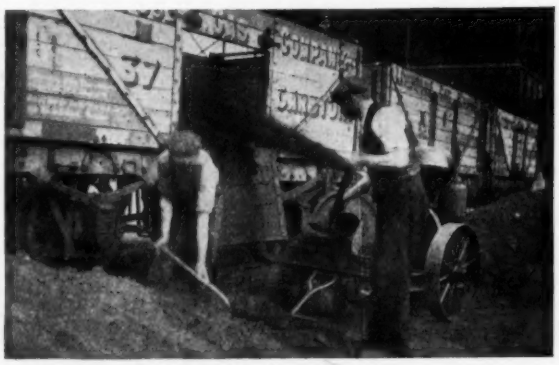

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NEW "Thompson"

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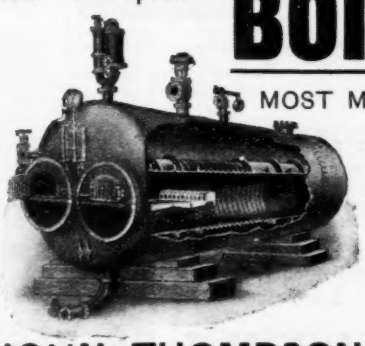


MOST MODERN "DISH-END" TYPE
WITH CORRUGATED SECTIONS
Standard Sizes in Stock
ALSO
WATER TUBE, CORNISH
AND VERTICAL BOILERS
SUPERHEATERS AND PIPEWORK

JOHN THOMPSON
"ECONOMIC"
BOILERS

JOHN THOMPSON (WOLVERHAMPTON) LTD.
WOLVERHAMPTON, ENG.

if YOU COULD QUESTION A GAS RETORT

What would you ask it?

Who are your makers? What is their experience in retort building and firebrick manufacture? Will you give me uninterrupted service for an appreciable length of time? *Are your heat-resisting properties better than the average?* If the retort was a "Glenboig" your questions would all be satisfactorily answered in *service* . . . service that only "Glenboig" can give . . . service that has won "Glenboig" high praise from Gas Works officials the world over.

GLENBOIG . . . *nearly a century's experience in retort building and firebrick manufacture!*

What Gas Managers say:—

"I have pleasure in testifying to the excellent quality of the Retorts and Firebricks which you have supplied for many years. The quality of your Clay is, in my opinion, unsurpassed and the finish and durability of your Retorts clearly prove that you have a first class system of building them."

"Your Retorts appear to be built with great care, the material well seasoned, and remarkably uniform. On examination, substance showed perfect compactness and the entire absence of air cavities. Well made . . . well burned . . . undoubtedly the best which have been used here."

Sole Proprietors and Manufacturers—

THE GLENBOIG UNION FIRECLAY CO. LTD.

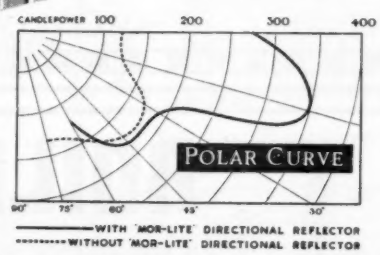
Head Office: 48 West Regent Street, Glasgow, C.2. *Tels.* Douglas 3009 and 2120

London Office: Abford House, Wilton Road, London, S.W.1. *Telephone* Victoria 0932

GLENBOIG BRICKS

G26

THE
STREET MOR-LITE LIGHTING
PATENT
DIRECTIONAL REFLECTOR



DOES 100% INCREASE IN ILLUMINATION AT NO EXTRA COST APPEAL TO YOU?

1. THE "MOR-LITE" DIRECTIONAL REFLECTOR increases the candle power by reflection at low angles where light is most needed.

2. Using a Twin Burner with No. 2 medium mantle there is a directional increase from normal 150 c.p. to over 350 c.p. in illumination.

3. Can be fitted in a moment. Can be instantly adjusted both vertically and horizontally to give maximum light service.

4. Wing reflectors can be adjusted by wing nuts to meet every need.

5. Wings lift off instantly for Lamp Cleaning, and are replaced without disturbing adjustments.

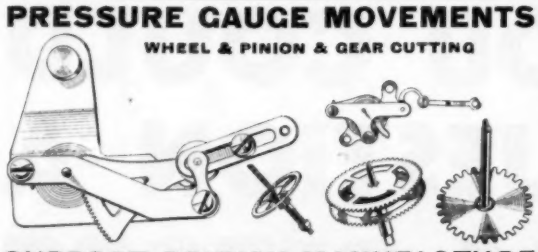
Send for sample and price list.

W. PARKINSON & CO., BIRMINGHAM, LONDON & BELFAST

INCORPORATED IN PARKINSON & COWAN (GAS METERS) LTD.

PRESSURE GAUGE MOVEMENTS

WHEEL & PINION & GEAR CUTTING



SUPPORT BRITISH MANUFACTURE

Before ordering abroad, ask Rotherham & Sons, Ltd, to quote you for your requirements in *Pressure Gauge Movements, Specialised Clock Work, Slot Meter Attachments, gas or electric.* Counting Machines or other Kindred Mechanical Devices.

ALL KINDS OF WHEELS & PINIONS

ROTHERHAM & SONS, LTD

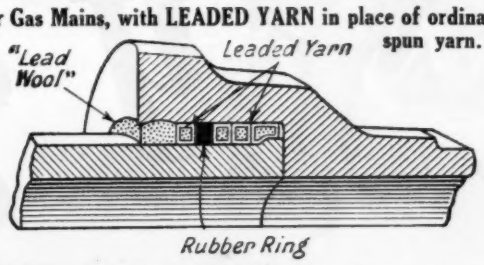
WATCH MANUFACTURERS & ENGINEERS

LONDON AND COVENTRY

USE THE "LEAD WOOL"—RUBBER RING

PATENT FLEXIBLE JOINT

for Gas Mains, with LEADED YARN in place of ordinary spun yarn.



THE LEAD WOOL Co., LTD.

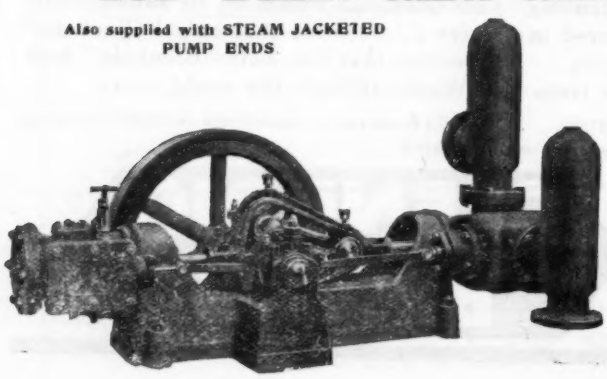
SNODLAND, KENT

'Phone: Snodland 84216. 'Grams: "Strength, Phone, Snodland."

THE "RELIABLE" STEAM PUMP

for TAR and all THICK FLUIDS.

Also supplied with STEAM JACKETED PUMP ENDS.



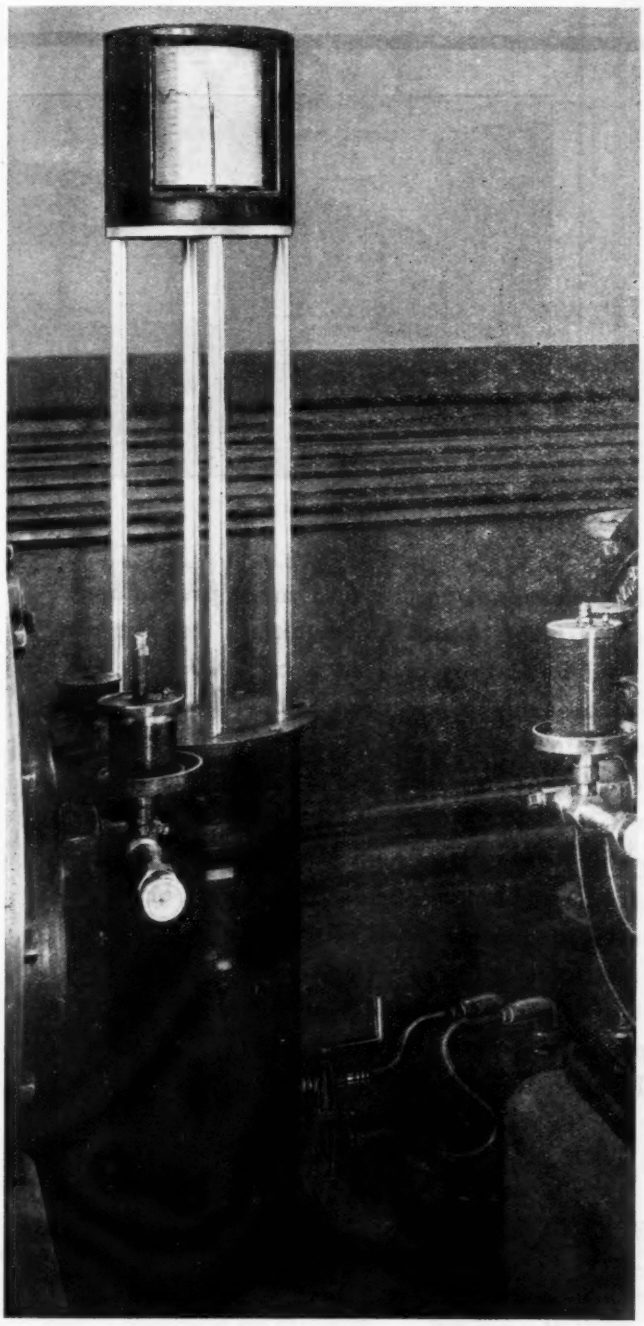
Write for No. 8 Catalogue.

Telegrams: "EVANS, WOLVERHAMPTON."
National Telephone Nos. 20864 and 20865

London Office:
109, KINGSWAY, W.C. 2.
Telephone: HOLBORN 1091
Telegrams: "DRYOSBO, WESTCENT, LONDON."

JOSEPH EVANS & SONS
(WOLVERHAMPTON), LTD.,
Culwell Works, WOLVERHAMPTON.

ARKON AIR FLOW RECORDERS



Arkon Air Flow Recorder measuring air to Purifiers at the Gas Light & Coke Co., Fulham Works.

The accompanying photograph is of the first Arkon Air Volume Recorder fitted at these works.

Some trouble had been experienced with a rotary meter and the cost involved in replacing it, prompted the Engineer to examine the claims of the Arkon Recorder. The saving in price was considerable and the only doubt was whether the claims put forward could be substantiated. That they were, is proved by the number of repeat orders since obtained from that Works.

With an Arkon Air Flow Recorder fitted it is possible to see at any time of the day or night the percentage of air being used for purification purposes. Any variations necessary can be quickly made and no tedious tests against a stop watch are required.

The purifier foreman can see immediately and at all times what is happening and so keep a very accurate control of the blower or fan speed. Hourly readings of the meter are dispensed with, and the consequent labour more usefully employed.

The very open chart provided is designed to suit the conditions of the particular installation and in consequence the recorder can be controlled within very small limits. Also it is guaranteed to be accurate within $\pm 1\%$ over the whole range. The only attention required is the changing of the chart and the winding of the clock. There is no intricate mechanism to get out of order and the filling medium is water.

Air flow recording is only one of the very many duties undertaken successfully by Arkon instruments.

If you have any flow recording problems we invite you to send them to us, when our engineering staff will gladly give you the advantage of their experience.

MADE IN ENGLAND

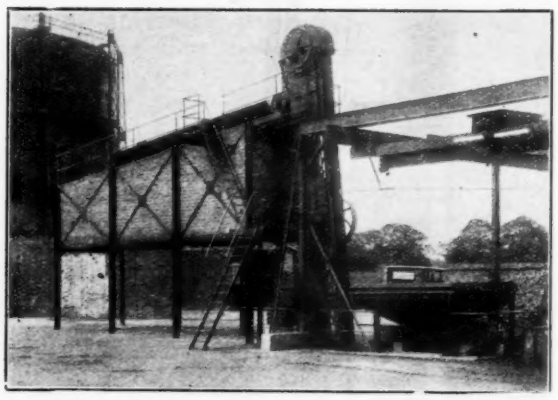
WALKER, CROSWELLER & CO., LTD.

QUEEN ELIZABETH STREET, LONDON, S.E.1. Phone : HOP 1386 (3 lines)

XUM

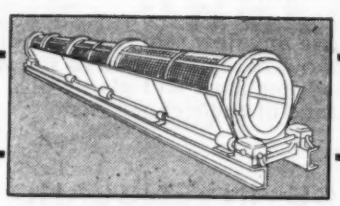
COKE PROPERLY PREPARED
★ ENSURES PROFIT ★

BEXHILL.

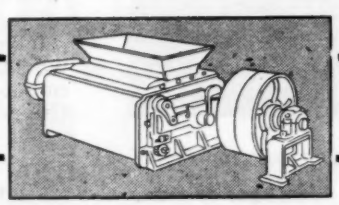


SOLIHULL.

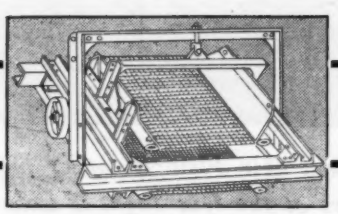
THAT the position of coke as a fuel is becoming more and more pre-eminent is largely due to the serious attention given by many Undertakings to the improved preparation for this purpose, and have thus created a STANDARD OF COKE VALUE. Sales have reached amazing proportions and it is no exaggeration to say that in a few years' time they will be greatly increased. To serve the growing *Coke-minded Public* to their and your satisfaction you must be equipped with up-to-date Plant, the purchase of which does not necessarily mean the expenditure of a large sum per ton of coke handled. Whether your requirements or resources are large or small we can submit proposals to adequately cover every condition. The expressed satisfaction we have given to Undertakings is our best advertisement and prompts us to ask you to send us particulars of your problems. We show above two examples of Complete Inexpensive Plants with capacities of approximately **5 TONS PER HOUR.**



Improved Rotary Type Screen.
24 in to 72 in. Diameter.



Patent Coke Cutting Machine.
2-100 tons per hour.



Patent Roto-Vibratory Screen.
Efficient, Silent and Smooth Running.

★ **ROBERT CORT & SON LTD** ★

READING BRIDGE IRONWORKS READING

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TELEGRAMS—
"QUALITY"
WORCESTER

LET US QUOTE
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FOR

(1) CAST IRON CASTINGS

(2) LAMP PILLARS

(3) VENTILATING COLUMNS FOR UNDERGROUND CHAMBERS

(4) VENTILATING & DRAINING COVERS & FRAMES

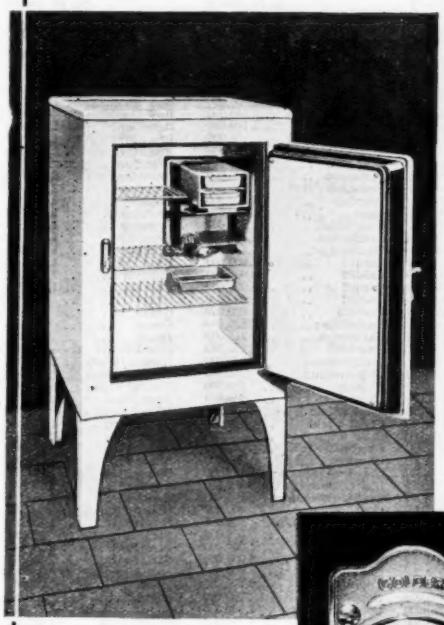
Etc.

ONLY HIGH GRADE IRON USED

HARDY & PADMORE LTD.
WORCESTER

ESTABLISHED ——— 1814

A new standard in Refrigerator values



BY APPOINTMENT

On right is the "Ten Point" Cold Control. At a turn of an externally-fitted pointer, ten varying temperatures are obtainable, including rapid freezing and de-frosting.

Here is the Freezolux L.2—the cabinet with a really generous storage capacity at a most reasonable price. This model cannot fail to enhance the market for Gas Refrigeration.

The Freezolux L.2 embodies all that is desirable in up-to-date refrigeration—no moving parts and silent, automatic, air-cooled operation and a special Cold Control.

All these advantages are now incorporated in a cabinet costing but £28 10s. Cash or which by Easy Payments will be delivered for £1 down.

At this price and with its *ample* storage room, the L.2 brings refrigeration within the m ans of the vast majority of British homes.

—FREEZOLUX L.2 AIR-COOLED REFRIGERATOR

ELECTROLUX LTD.
153-155 REGENT STREET, LONDON, W.1
WORKS: LUTON, BEDFORDSHIRE

COUPON

Please send me booklet describing the Electrolux L.2

Name .....

Address .....

G.J. .....

E.I.H

Humphreys & Glasgow Ltd.
Water-Gas

	Cu. Ft. Daily
Aarhus	800,000
Abertillery	500,000
Abertillery	100,000
Admiralty:	
British	4,000,000
French	1,600,000
Agram	200,000
Airdrie	430,000
Aldershot	1,400,000
Aldershot	1,000,000
Aldershot	1,316,000
Algiers	1,760,000
Alkmaar	400,000
Allenstein	200,000
Alost	700,000
Amersfoort	300,000
Amsterdam	1,000,000
Amsterdam	1,000,000
Amsterdam	2,700,000
Amsterdam	1,350,000
Antwerp	1,500,000
Antwerp	1,000,000
Antwerp	1,500,000
Antwerp	1,900,000
Arundel	215,000
Ascot	423,000
Ashford	250,000
Athens, Greece	550,000
Augsburg	425,000
Aylesbury	150,000
Aylesbury	470,000
Banbury	200,000
Banff	125,000
Barmen	500,000
Barnsley	588,000
Barrow	300,000
Barrow	500,000
Barry	500,000
Barry	720,000
Bath	1,000,000
Bath	1,000,000
Bath	1,300,000
Bath	1,200,000
Bedford	1,000,000
Belfast	1,700,000
Belfast	4,500,000
Belfast	1,250,000
Belfast	1,250,000
Belfast	2,250,000
Benrath	125,000
Berkhampstead	259,000
Berlin:	
Charlottenb'g	2,500,000
Danziger Str.	1,600,000
Neukoelln	1,350,000
Schmargendorf	760,000
Tegel	10,095,000
Berne, Switz.	725,000
Bexhill	400,000
Bideford	258,000
Bilston	375,000
Bilston	125,000
Birmingham:	
Adderley St.	675,000
Adderley St.	850,000
Nechells	3,000,000
Nechells	3,000,000
Nechells	3,000,000
Nechells	7,650,000
Swan Village	1,500,000
Windsor St.	3,000,000
Windsor St.	3,000,000
Windsor St.	6,100,000
Bishop's Stortford	200,000
Bishop's Stortford	300,000
Bishop's Stortford	200,000
Bishop's Stortford	300,000
Blackburn	1,190,000
Blantyre	150,000
Blois	125,000
Blois	125,000
Bochum	530,000
Bognor	100,000
Bognor	423,000
Bognor	500,000
Bo'ness	125,000
Bo'ness	250,000
Boulogne	340,000
Bournemouth	1,000,000
Bournemouth	500,000
Bournemouth	1,500,000
Bournemouth	1,000,000
Bournemouth	500,000
Bournemouth	1,530,000
Bournemouth	2,000,000
Bournemouth	500,000
Bournemouth	2,750,000
Bradford	1,280,000
Bremen	550,000
Bremen	950,000
Bremen	850,000
Brentwood	250,000
Brescia	568,000
Brescia	588,000
Brest	550,000
Bridgwater	200,000
Bridlington	150,000
Bridlington	215,000
Bridlington	550,000
Brieg	100,000
Brierley Hill	250,000
Brierley Hill	425,000
Brighton	1,750,000
Brighton	1,850,000
Brighton	750,000
Brighton	2,750,000
Brighton	3,000,000
Bristol	2,000,000
Bristol	2,500,000
Bristol	825,000
Bristol	825,000
Bristol	1,500,000
Bromley	1,500,000
Bruges	200,000
Bruges	600,000
Brussels:	
Anderlecht	350,000
Anderlecht	350,000
Forest	1,000,000
Forest	1,000,000
Forest	1,000,000
Forest	1,500,000
Forest	88,000
Koekelberg	1,000,000

	Cu. Ft. Daily
Brussels:	
St. Gilles	1,000,000
St. Josse	1,000,000
St. Josse	600,000
St. Josse	775,000
Ville	750,000
Ville	750,000
Ville	1,500,000
Ville	350,000
Bucarest	1,100,000
Buckie	164,000
Budapest	50,000
Budapest	1,750,000
Budapest	200,000
Budapest	250,000
Burnley	1,350,000
Caen	250,000
Cambridge	500,000
Cambridge	1,000,000
Cambridge	1,700,000
Cardiff	2,000,000
Cardiff	3,000,000
Cardiff	1,950,000
Cardiff	600,000
Carlisle	600,000
Carlsruhe	500,000
Carnarvon	248,000
Charleroi	1,250,000
Châteauroux	125,000
Châteauroux	125,000
Châtelet	500,000
Chester	564,000
Chesterfield	430,000
Chesterfield	90,000
Chesterton	197,000
Chichester	250,000
Chorley	300,000
Cie. des Compteurs	1,150,000
Cie. Lorraine de Ch.	210,000
Cie. Mines de Roche	585,000
Coatbridge	400,000
Commercial, L'n	850,000
Commercial	850,000
Commercial	1,250,000
Commercial	2,000,000
Commercial	800,000
Commercial	2,100,000
Copenhagen	700,000
Copenhagen	2,500,000
Copenhagen	1,750,000
Copenhagen	1,200,000
Courtrai	250,000
Coventry	600,000
Coventry	600,000
Coventry	1,000,000
Coventry	1,250,000
Coventry	350,000
Cowdenbeath	420,000
Cracow	400,000
Cranleigh	188,000
Crefeld	500,000
Crewe	700,000
Crewe	800,000
Crosfield & Sons	1,500,000
Crosfield & Sons	1,500,000
Crowborough	150,000
Croydon	1,250,000
Croydon	625,000
Croydon	625,000
Croydon	550,000
Croydon	650,000
Croydon	1,125,000
Croydon	150,000
Croydon	3,000,000
Croydon	6,000,000
Deal	250,000
Deal	250,000
Debreczin	100,000
Derby	1,500,000
Derby	2,000,000
Deventer	150,000
Deventer	200,000
Devonport	1,600,000
Devonport	1,100,000
Doncaster	1,350,000
Dorking	150,000
Dorking	300,000
Dorking	130,000
Dover	500,000
Dover	300,000
Dublin	2,000,000
Dublin	2,000,000
Dublin	650,000
Dudley	600,000
Dundee	1,500,000
Dundee	1,650,000
Dundee	900,000
Dunedin, N.Z.	150,000
Dunedin	275,000
Durham	200,000
Dusseldorf	1,000,000
Eastbourne	1,250,000
Eastbourne	1,550,000
Edinburgh	2,000,000
Edinburgh	2,800,000
Eindhoven	1,500,000
Electro-Chimie	650,000
Enschede	282,000
Epping	500,000
Epsom	225,000
Epsom	300,000
Essen	1,400,000
Essen-Borbeck	1,400,000
Exeter	1,100,000
Exeter	1,200,000
Exmouth	376,000
Falmouth	150,000
Falmouth	200,000
Farnham	300,000
Faversham	200,000
Flensburg	300,000
Flensburg	125,000
Folkestone	1,800,000
Fond. del Pignone	164,000
Forst	300,000
Frankenthal	175,000
Fuel Research Wks.	500,000
Fuel Research Wks.	500,000
Gablonz	140,000
Gas L. & C. Co.:	
Beckton	10,000,000
Beckton	7,000,000
Beckton	3,500,000
Beckton	7,000,000

	Cu. Ft. Daily
Gas L. & C. Co.:	
Beckton	7,000,000
Beckton	5,250,000
Beckton	4,500,000
Beckton	3,000,000
Beckton	1,500,000
Bow Common	1,000,000
Bow Common	1,150,000
Bow Common	150,000
Brentford	1,200,000
Brentford	1,250,000
Brentford	350,000
Brentford	750,000
Brentford	6,000,000
Bromley	3,750,000
Bromley	2,250,000
Bromley	1,000,000
Bromley	1,000,000
Bromley	1,000,000
Bromley	1,450,000
Bromley	1,350,000
Fulham	2,500,000
Fulham	1,700,000
Grays	250,000
Grays	400,000
Grays	725,000
Ilford	650,000
Ilford	750,000
Kensal Green	2,250,000
Kensal Green	2,250,000
Kensal Green	2,250,000
Nine Elms	2,750,000
Nine Elms	750,000
Nine Elms	1,870,000
Nine Elms	2,850,000
Shoreditch	900,000
Shoreditch	2,700,000
Shoreditch	2,725,000
Southall	2,000,000
Southall	3,000,000
Staines	600,000
Stratford	1,700,000
Stratford	850,000
Stratford	2,350,000
Stratford	2,350,000
Gelsenkirchen	525,000
Geneva	500,000
Geneva	700,000
Geneva	1,270,000
Gennevilliers	10,600,000
Gennevilliers	2,900,000
Girvan	235,000
Glasgow	3,000,000
Glasgow	2,500,000
Glasgow	2,250,000
Glossop	340,000
Gloucester	800,000
Gloucester	1,000,000
Gosport	200,000
Gosport	225,000
Göteborg	300,000
Göteborg	600,000
Göteborg	1,000,000
Grandenz	200,000
Groningen, Holland	500,000
Groningen	1,250,000
Guest Keen & Piggotts, Ltd.	1,936,000
Guildford	350,000
Guildford	200,000
Guildford	350,000
Guildford	1,100,000
Guildford	150,000
Haarlem	850,000
Hamburg	1,750,000
Hampton Court	900,000
Hampton Court	600,000
Hampton Court	1,100,000
Hanley	800,000
Hanley	800,000
Hartlepool	750,000
Hartlepool	765,000
Hastings	1,250,000
Haywards Heath	470,000
Haywards Heath	500,000
Hebden Bridge	200,000
Heidelberg	200,000
Hereford	525,000
Hertford	197,000
Hertford	244,000
Hessle	150,000
Heywood	500,000
High Wycombe	752,000
Hilversum	850,000
Hilversum	1,000,000
Hinckley	250,000
Holyhead	197,000
Hong Kong	450,000
Hong Kong	450,000
Hornsey	1,000,000
Hornsey	1,000,000
Hornsey	750,000
Hornsey	750,000
Horsham	235,000
Houilière de Lievin	2,900,000
Hull	1,500,000
Hull	1,000,000
Hull	1,600,000
Innsbruck	200,000
Ipswich	750,000
Ipswich	1,250,000
Ipswich	600,000
Jersey	564,000
Jersey	564,000
Kampen	350,000
Karlsbad	350,000
Kendal	329,000
Kidsgrove	235,000
Kiel	1,000,000
Kiel	880,000
Kilmarnock	500,000
Kilmarnock	585,000
King's Lynn	197,000
King's Lynn	400,000
Kingston-on-Th.	3,400,000
Kirkintilloch	360,000
Kirkintilloch	827,000
Kolozvar	100,000
Lancaster	500,000
Langley Mill	500,000
Largs	235,000
Lausanne	250,000
Lausanne	385,000
Lausanne	970,000

	Cu. Ft. Daily
Le Mans	420,000
Lea Bridge	350,000
Lea Bridge	350,000
Lea Bridge	400,000
Lea Bridge	1,000,000
Lea Bridge	1,500,000
Lea Bridge	1,530,000
Leamington	600,000
Leamington	525,000
Leatherhead	705,000
Leeds	1,500,000
Leeuwarden	400,000
Leicester	2,700,000
Leiden	500,000
Leiden	575,000
Leigh	350,000
Lemberg	260,000
Lemberg	500,000
Letchworth	362,000
Letchworth	423,000
Liége	1,000,000
Liége	750,000
Lille	860,000
Lincoln	500,000
Lincoln	893,000
Littlehampton	500,000
Liverpool	3,500,000
Liverpool	4,500,000
Liverpool	750,000
Liverpool	1,750,000
Liverpool	1,250,000
Liverpool	3,000,000
Liverpool	1,500,000
Liverpool	1,250,000
Liverpool	2,350,000
Liverpool	3,000,000
Liverpool	8,600,000
Long Eaton	430,000
Long Eaton	170,000
Longton	600,000
Lourain	800,000
Lubeck	400,000
Luton	400,000
Luton	300,000
Maastricht	200,000
Macclesfield	800,000
Magdeburg	1,400,000
Maidenhead	225,000
Maidenhead	225,000
Maidenhead	175,000
Maidenhead	175,000
Maidenhead	200,000
Maidenhead	200,000
Maidstone	500,000
Maidstone	500,000
Malines	500,000
Malines	575,000
Malmö	350,000
Malta	400,000
Manchester	3,500,000
Manchester	3,500,000
Manchester	1,500,000
Mansfield	330,000
Mansfield	493,000
Margate	960,000
Marlborough	100,000
Mayence	700,000
Melbourne	5,000,000
Merthyr Tydfil	200,000
Merthyr Tydfil	200,000
Middlesbrough	1,250,000
Middlesbrough	750,000
Middlesbrough	900,000
M/M. Woolston	9,000,000
Minehead	300,000
Monaco	275,000
Monaco	618,000
Monaco	618,000
Monaco	400,000
Complete Gasification	
Mons	500,000
Montevideo	1,222,000
Morecambe	333,000
Moscow	1,000,000
Munich	1,400,000
Namur	175,000
Narbonne	350,000
Nelson	400,000
Nelson	350,000
Neuchâtel, Switz.	250,000
Neuss	140,000
Newbury	250,000
Newcastle	2,500,000
Newcastle, N.S.W.	500,000
Newhaven	235,000
Newport Pagnell	188,000
Nice	900,000
Nice	1,295,000
Nictheroy	250,000
Nimes	420,000
North Middlesex	200,000
North Middlesex	200,000
North Middlesex	1,000,000
North Middlesex	1,600,000
North Middlesex	800,000
Complete Gasification.	
North Middlesex	900,000
2nd Complete Gasification.	
North Sydney	500,000
North Sydney	500,000
Norwich	1,000,000
Norwich	300,000
Norwich	500,000
Norwich	1,500,000
Nottingham	1,000,000
Nottingham	1,000,000
Nuneaton	125,000
Oberhausen	175,000
Oldbury	500,000
Oldenburg	200,000
Ormskirk	170,000
Ostend	100,000
Ostend	200,000
Zandvoorde	700,000
Oxford	4,500,000
Palermo	968,000
Palermo	880,000
Paris:	
Clichy	4,000,000
Ivry	2,355,000
Landy	6,000,000
Landy	6,000,000
Landy	5,295,000

	Cu. Ft. Daily
Paris:	
La Villette	4,000,000
La Villette	2,000,000
La Villette	2,000,000
Paris-Plage	125,000
Pau	550,000
Pavie	194,000
Pavie	212,000
Pembroke	240,000
Perigueux	350,000
Perth, W.A.	125,000
Perth, W.A.	1,000,000
Petone, N.Z.	200,000
Piggott & Co.	1,500,000
Plymouth	2,000,000
Poitiers	350,000
Pontypool	120,000
Port Elizabeth	400,000
Portsmouth	1,000,000
Portsmouth	2,000,000
Portsmouth	800,000
Portsmouth	2,000,000
Posen	450,000
Posen	700,000
Prague	140,000
Preston	1,400,000
Ramsgate	437,000
Reading	1,000,000
Reading	1,000,000
Reading	600,000
Redditch	500,000
Redhill	275,000
Redhill	300,000
Redhill	1,100,000
Redhill	625 000
Reichenberg	400,000
Reval	350,000
Rhymney	175,000
Rhymney	250,000
Riddings	258,000
Ripley	120,000
Rochester	2,200,000
Rochester	2,800,000
Romford	300,000
Romford	350,000
Romford	1,200,000
Rotterdam	850,000
Rotterdam	1,500,000
Rotterdam	750,000
Rotterdam	750,000
Rotterdam	600,000
Rotterdam	2,000,000
Rotterdam	500,000
Roulers, Belgium	250,000
Royston (Yorks.)	250,000
Rugby	1,000,000
Rugby	450,000
Rushden	425,000
Rushden	517,000
Rushden	225,000
Ryde	600,000
Ryde	600,000
Saffron Walden	235,000
St. Albans	700,000
St. Albans	580,000
St. Albans	1,500 000
St. Andrews	210,000
St. Andrews	409,000
St. Gallen	225,000
St. Gallen	225,000
St. Nicolas, Belgium	250,000
Sté. Ch.Gr. Paroisse	1,320,000
Sté.Ch.Gr Paroisse	2 900,000
Sté. I. & F. de Lens	1,130,000
Sté. I. & F. de Lens	1,130,000
Sté. Kuhlmann	1,270.000
Sté. Kuhlmann	3,200,000
Sté. Kuhlmann	2,150,000
Sté. Kuhlmann	3,350,000
Sté. Tubes Meuse	545,000
San Paulo	700,000
Scarborough	800,000
Scarborough	200,000
Scarborough	350,000
Scarborough	1,300,000
Scarborough	1,350,000
Seaford	200,000
Shanghai	225,000
Shanghai	225,000
Shanghai	1,600,000
Shanklin	259,000
Shanklin	400,000
Sheerness	200,000
Sheerness	180,000
Sheerness	200,000
Sheerness	220,000
Sheffield	1,530,000
Sheffield	3,000,000
Steel Prods.	3,000,000
Shirebrook	500,000
Shrewsbury	300,000
Shrewsbury	170,000
Sidmouth	225,000
Singapore	600,000
Sittingbourne	259,000
Southampton	800,000
Southampton	500,000
Southampton	600,000
Southampton	100,000
Southampton	1,000,000
Southampton	1,450,000
Southend	1,250,000
Southend	900,000
Southend	900,000
Southend	600,000
Southgate	400,000
Southgate	500,000
Southgate	800,000
Southgate	500,000
Southport	750,000
Southport	900,000
Southport	900,000
Southport	450,000
South Shields	650,000
South Shields	1,250,000
Stafford	500,000
Stettin	880,000
Steyning	150,000
Stirling	400,000
Stirling	970,000
Stockholm	1,500,000
Stockholm	1,750,000
Stockport	600,000

	Cu. Ft. Daily
Stockport	600,000
Stockport	400,000
Stockport	400,000
Stockton	500,000
Stockton	250,000
Stourbridge	500,000
Stourbridge	500 000
Sunderland	2,250,000
Sunderland	300,000
Sunderland	475,000
Sutton	1,269,000
Sutton	1,625,000
Swanage	300,000
Swansea	750,000
Swansea	1,000,000
Swansea	450,000
Swansea	1,250,000
Swansea	2,000,000
Swindon	300,000
Swindon	450,000
Swindon	400,000
Sydney	1,000,000
Sydney	1 000,000
Sydney	1,000,000
Sydney	1,000 000
Sydney	2,250,000
Sydney	2,750,000
Taunton	225 000
Taunton	350,000
Tawe Valley	275,000
Teignmouth	200 000
The Hague	1,000,000
The Hague	500,000
The Hague	1,750,000
The Hague	1,500,000
The Hague	775,000
The Hague	1,500,000
The Hague	2,333,000
Tilburg	400,000
Tirlemont	120,000
Tokyo	2,000,000
Torquay	350,000
Torquay	350,000
Torquay	320,000
Tottenham	750,000
Tottenham	750,000
Tottenham	350,000
Tottenham	1,000,000
Tottenham	1,000,000
Tottenham	1,250,000
Tottenham	2,500,000
Tottenham	1,000,000
Tottenham	500,000
Tottenham	1,000,000
Toulouse	1,800,000
Toulouse	785.000
Toulouse Natl. Wks.	2,400,000
Toulouse Natl. Wks.	6,200,000
Tournai	700,000
Tours	550,000
Trowbridge	250,000
Trowbridge	150,000
Tunbridge Wells	1,000,000
Tunbridge Wells	1,000,000
Tunis	175,000
Tynemouth	1,100,000
Tynemouth	1,100,000
Ulm	400,000
Union Chim.-Belge	1,977,000
Utrecht	1,000,000
Utrecht	1,000,000
Uxbridge	752,000
Uxbridge	1,000,000
Vancouver	3,800,000
Verviers	1,000,000
Vevey, Switz.	650,000
Victoria, B.C.	500,000
Vienna	3,500,000
Vienna	2,500,000
Walsall	750,000
Walsall	375,000
Waltham	400,000
Waltham	140,000
Walton-on-Thames	970,000
Wandsbek	125,000
Wandsworth	1,830,000
Wandsworth	4,230,000
Wanganui, N.Z.	376,000
Ware	150,000
Ware	282,000
Warwick	125,000
Wasmuel	500,000
Watford	300,000
Watford	350,000
Watford	550,000
Watford	1,250,000
Wath	430,000
Weimar	100,000
Wellingborough	525,000
Wellingborough	525,000
Wellingborough	550 000
Wellington, N.Z.	350,000
Wellington	300,000
West Bromwich	550,000
Westgate	250,000
Weston-Mare	350,000
Weston-Mare	350,000
Weston-Mare	150,000
Weston-Mare	150,000
Weston-Mare	500,000
Wexford	100,000
Weymouth	400,000
Weymouth	100,000
Weymouth	658,000
Whitstable	423,000
Widnes	500,000
Wiesbaden	850,000
Wigston	250,000
Winchester	225,000
Winchester	125,000
Winchester	410,000
Winchester	325,000
Woking	400,000
Wolverhampton	1,500,000
Wolverhampton	1,000,000
Wolverhampton	250,000
Wolverhampton	400,000
Worthing	525,000
Yarmouth	500,000
Yarmouth	125,000
Yeovil	340,000
Zwolle	200,000
Zwolle	200,000
Zwolle	700,000

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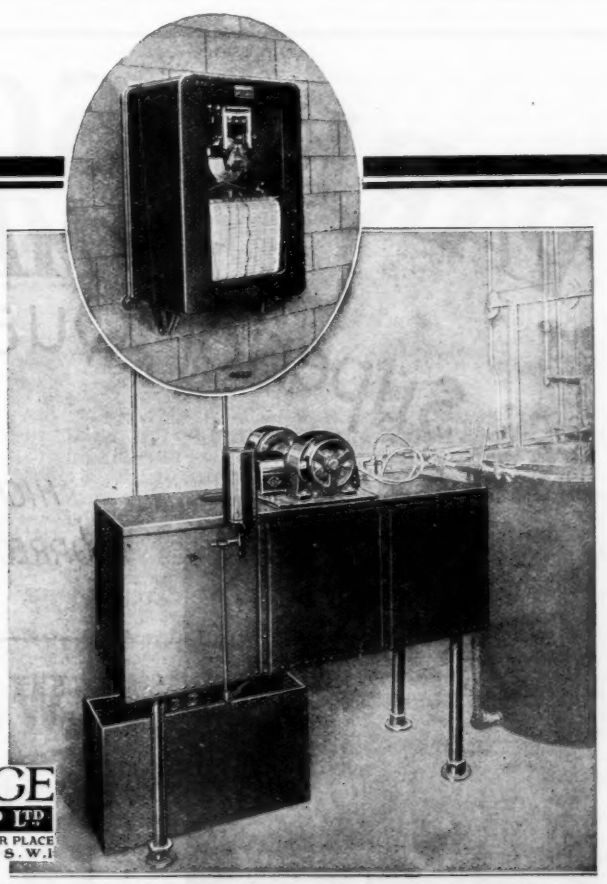

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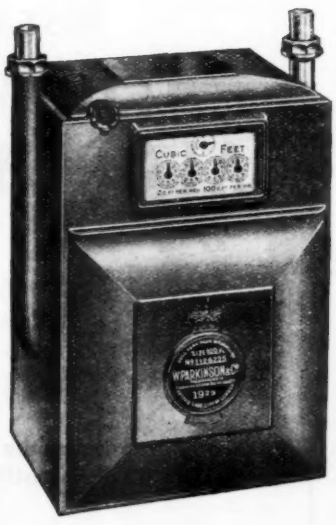

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THE GAS JOURNAL

APRIL 19, 1933

Vol. 202. 85th Year No. 3648

A Glance at the Contents—

National Gas Council.

The question of the re-verification of gas meters was discussed at this month's meeting of the Central Executive Board of the National Gas Council. [p. 160.]

The Bamag Dry Gasholder.

In the "JOURNAL" for Feb. 8 we gave an account of the gasholder built at the Berlin Bernau Gas-Works. A more detailed description has been sent us by Bamag-Meguin (Great Britain), Ltd., and this should be of interest to our readers. [p. 161.]

Institution of Gas Engineers.

The provisional programme of the annual general meeting of the Institution to be held in Liverpool on May 30-June 2, under the Presidency of Mr. Ralph E. Gibson, will be found on p. 152.

Utilizing our Coal Resources more Efficiently.

A Symposium on the Utilization of Coal was held in the Royal Institution, London, last week, at the instance of the British Science Guild. One of the papers submitted was by Mr. Stephen Lacey. [p. 158.]

Use of Coke for Domestic Purposes.

The Institution of Mining Engineers Utilization of Coal Committee have given us permission to publish a memorandum which is one of a series dealing with developments in the utilizaton of coal and its bye-products. [p. 162.]

Sunderland Basic Price Order.

The Sunderland Corporation successfully applied for the Sunderland Gas Company's Special Order, recently made by the Board of Trade, to be referred to a Select Committee of the House of Lords for further consideration. [p. 164.]

Steel Mains for Bridges.

An interesting paper was read by Mr. H. V. Williams, before the Wales and Monmouthshire Junior Gas Association, dealing with steel mains which the Cardiff Gas Light and Coke Company have recently laid over bridges in their area. [p. 170.]

Efficient Boiler Management.

In a paper before the Scottish Junior Gas Association (Western District) Mr. J. Webster, of Port Glasgow, puts forward some observations on methods whereby the thermal and economic efficiencies of gas-works steam-raising plant (solid-fuel fired) may be improved. [p. 165.]

Increasing Gas Consumption.

In a paper to the Wales and Monmouthshire Junior Gas Association, Mr. R. T. Mills explained that, to replace as many black cookers as possible on the district, the Cardiff Gas Light and Coke Company has devised a scheme which enables prepayment consumers to obtain an all-enamel cooker complete with rack and back, at a very low cost per quarter. Large numbers are taking advantage of the offer, and the days of the black cooker are numbered. [p. 169.]

Forthcoming Engagements

April 22.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION.—General Meeting at Newport.

April 22.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Sheffield. Paper by Mr. H. Wadsworth.

April 25.—I.G.E.—Gasholder Sub-Committee, 3 p.m.

April 25.—I.G.E.—Meeting of Gas Appliances Sub-Committee, 11 a.m.

April 27.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, S.W. 1, 2.30 p.m. Subject for discussion will be "Benzole Extraction, Technical and Commercial Aspects."

April 27.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (WESTERN SECTION).—Commercial Meeting at Exeter, 2.30 p.m.

April 27.—I.G.E.—Meeting of Gasholder Sub-Committee, 2.30 p.m.

April 29.—WESTERN JUNIOR ASSOCIATION.—Meeting at Bristol. Presidential Address and Annual General Meeting.

May 1.—I.G.E.—Meeting of Meters Committee, 2.30 p.m.

May 4. I.G.E.—Meeting of Joint Lighting Committee, 2.30 p.m.

May 4.—MIDLAND JUNIOR ASSOCIATION.—Annual General Meeting and Address by Mr. W. B. M'Lusky.

May 5.—NORTH OF ENGLAND ASSOCIATION.—Annual Meeting, County Hotel, Newcastle, at 2 o'clock.

May 5.—N.G.C.—Annual Meeting of District Executive Board for Scotland, North British Station Hotel, Edinburgh.

May 5.—FEDERATION OF GAS EMPLOYERS (SCOTLAND).—Annual Meeting, North British Station Hotel, Edinburgh.

May 6.—MANCHESTER DISTRICT JUNIOR ASSOCIATION.—Visit to Runcorn Gas-Works. Paper by Messrs. H. Goodier and W. E. Saunders.

May 10.—N.G.C.—Annual Meeting, Hotel Metropole, London, 2.30 p.m.

May 10.—FEDERATION OF GAS EMPLOYERS.—Annual Meeting, Hotel Metropole, London, 3.15 p.m.

May 11.—SOCIETY OF BRITISH GAS INDUSTRIES.—Annual General Meeting and Dinner, Hotel Metropole, London.

May 11-12.—EASTERN COUNTIES ASSOCIATION.—Half-Yearly Meeting at Croydon.

May 17.—B.C.G.A.—Meetings of Executive Committee, 11 a.m.; General Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

May 18.—WALES AND MONMOUTHSHIRE ASSOCIATION.—Meeting at Abertillery.

May 19.—SOUTHERN ASSOCIATION.—Meeting at Bridgwater.

May 19.—MANCHESTER DISTRICT ASSOCIATION.—Special Meeting at Leeds.

May 25.—MIDLAND ASSOCIATION. — Spring meeting at Stafford.

XUM

EDITORIAL NOTES

The Liverpool Institution Meeting

FROM the provisional programme of the Annual General Meeting of the Institution of Gas Engineers to be held in Liverpool, under the Presidency of Mr. Ralph E. Gibson, from May 30 to June 2, which is published in this issue of the "JOURNAL," it will be seen that most complete arrangements have been made for the profit and pleasure of those attending. There is every reason for anticipating that the attendance will be a record one, and that the proved organizing ability of Mr. J. R. W. Alexander, the Secretary, will ensure another outstanding success.

The arrangement under which the Institution has permitted, in the week prior to each of the last two Autumn Research Meetings, the pre-publication, without comment, of the reports presented at those meetings, has proved of such general convenience that it has been decided to allow the Papers and Reports to be presented at the forthcoming Meeting to be similarly pre-published.

The issue of the "JOURNAL" dated May 24 will therefore be made a Special Number, containing text of papers to be submitted and other Institution Meeting features.

The Visit to America

So that members of the Institution of Gas Engineers may be present at the meetings, the Canadian Gas Association has postponed its annual convention to Sept. 18 and 19, and the American Gas Association has specially fixed the dates of its convention for Sept. 25-28.

The present arrangements for the visit are that members will sail from Liverpool on the "Duchess of Bedford" on Sept. 8, reaching Quebec on Sept. 15. A few hours will be spent there, and the journey will be continued by the ship to Montreal. A day there, and then to Ottawa, where two days will be spent. Thence to Toronto, and after a day there visits on succeeding days will be paid to Hamilton, Niagara Falls, and Detroit, following which four days will be spent in Chicago.

Then the Laboratories of the American Gas Association in Cleveland will be inspected. The visitors will proceed—*via* Pittsburg, Washington, and Philadelphia (staying for a day in each of these cities)—to New York, to which three days will be devoted. The visit will be concluded with a day in Boston, whence departure will be made on Oct. 8 on the "Georgic." It is hoped to reach Liverpool on Oct. 16, the whole tour having taken 39 days.

Domestic Coke

IN the "JOURNAL" for Oct. 29, 1930, we made a plea for a national standard nomenclature for all coke sizes. At the time we recognized the important work which has been done by the London and Counties Coke Association, which has certainly helped to solve the problem in the London area, but we endeavoured to look at the matter from a national angle. We said: "There appear to us to be two main reasons why the definition of the various coke sizes differs from town to town. First, the grading of coke into different sizes has been developed piecemeal. When it was decided to split up the coke below, say, 2½ in. into three sizes, three names had to be invented, and these were settled locally. Thus a number of names were established for the same article. Secondly, it seems to us that gas undertakings may have preferred a certain amount of flexibility in what constitutes a given coke grade, so that market demands could be balanced. We would suggest that lack of uniformity in the size of material supplied has been the source of many of the complaints which have been made against coke. The Gas Regulation Act has made it necessary for each gas undertaking to decide what calorific value gas it will supply, and then to conform strictly to that quality. Has not the consumer equal right to expect that the various coke grades will be standard in their quality?"

Our suggested standard coke nomenclature was as follows: Large coke, over 2½ in.; broken coke, 2½ in. to 1¼ in.; nut coke, 1¼ in. to ¾ in.; bean coke, ¾ in. to ½ in.; coke breeze, ½ in. to 0 in.; screened breeze, ½ in. to ¼ in.; coke dust, ¼ in. to 0 in.

We believe that such a system of standardization would have a far-reaching influence on coke sales and the consequent prosperity of the Gas Industry. Different types of coke-burning equipment require particular sizes of coke if they are to operate at maximum efficiency and to the satisfaction of the user. This fact is realized by the Utilization of Coal Committee of the Institution of Mining Engineers, who have issued a memorandum in which a scale of standard sizes is set out and recommended for adoption by the Coke Oven Industry. The only real difference between their recommendation and the one we suggested is that their sizing is closer between the range 3 in. to 1 in. They recommend the following standard grades of size: 3 in. to 2½ in.; 2½ in. to 2 in.; 2 in. to 1½ in.; and 1½ in. to 1 in. For coke of less than 1 in., they suggest 1 in. to ⅜ in. and ⅝ in. to ⅜ in.

If the Coke Oven Industry put this recommendation into practice it will certainly help to develop their domestic business; and in regard to the domestic market the memorandum of the Utilization of Coal Committee is illuminating. In 1914, of the 11 million tons of oven coke made in Great Britain, less than 1% was used for "domestic" purposes (including the central heating of public buildings). During the years 1928-30, about 16% of the oven coke made was employed for domestic purposes. In 1931, the production of coke decreased owing to the decline in the production of pig iron, but the domestic sales were not less than in 1930 and formed 26% of the total production. The memorandum states clearly that "the market for domestic coke can be more profitable than the metallurgical coke market."

The foregoing points to two things. First, that the public are awakening to the economy and efficiency of properly prepared high-temperature coke; secondly, that unless the Gas Industry as a whole decides to sell uniform coke of accurate gradings, gas sales will suffer. And the open firegrate is a potential market which gives ample scope for both the Gas Industry and the Coke Oven Industry.

The memorandum, which is published on later pages of this issue, also considers the effects of ash and moisture contents on the satisfactory use of coke in both slow combustion stoves and the open firegrate; and in this connection too the recommendations of the Committee are very much to the point.

Mixed Views

A SYMPOSIUM on the utilization of coal was held at the Royal Institution last month and led to the expression of many and varied views regarding the best way of bringing prosperity back to the coal industry. Capt. Bernard Acworth envisaged a future when industries would not be subsidized; when electricity would be generated not at a few super power stations, but at small local stations, and when all our cities and towns would revert to electric street cars; when country houses would have high-pressure gas reservoirs; when coal gas would be the fuel for all motor transport; when coal

would once again be used by men-of-war and merchant ships alike. It would, he suggested, be a return to prosperity for the nation as well as the coal industry. " In a world set free from legislative favours and interference, a great expansion in the use of gas for lighting, cooking, and heating can confidently be predicted."

Capt. Acworth's future is not likely to materialize fully, but he is certainly right when he maintains that gas and electricity are the allies and not the enemies of the coal industry, and that expansion in the business of both these refined fuels will take place. This point was also made by Mr. Stephen Lacey, who spoke of the development of the use of gas, and showed how thermally efficient the gas-making process is. In this connection his statement is of interest that, taking utilization efficiencies into account, two tons of coal, one used directly for domestic purposes and one for electricity generation, will together yield only the same amount of useful heat as one ton treated in a gas-works, without having regard to tar and other products not used as fuel.

Dr. E. F. Armstrong asked for the removal of the quota system, better grading of coke to enable it to displace raw coal in the open firegrate, and a thorough realization by the coal industry that gas and electricity are its best friends. Mr. H. T. Tizard, who presided, remarked that coal possessed two disadvantages—it produced fog in the atmosphere and fog in the mind. That we are using less coal does not stir him, as a fact. Coal is being employed much more efficiently nowadays, and first principles suggest the desirability of using sparingly natural capital resources such as coal. Certainly scientific principles demand its carbonization and not its use in the raw state.

One of the remarks of Capt. Acworth at the symposium (which was more like a roundabout debate than anything else) was that " to obtain oil by the hydrogenation of raw coal is technically possible, as has been known for years, but as an economic proposition it is fantastic." This hardly tallies with what Sir Harry McGowan had to say in his address as Chairman of Imperial Chemical Industries, Ltd., at the annual meeting of the Company last week. He explained that the Company has continued research work on hydrogenation with marked success. " There is," he said, " no foundation for the general suggestion that the direct hydrogenation of coal is unsound economically by comparison with carbonization of the raw coal first, followed by the hydrogenation of the resulting tar. Our technical staff is still working on the direct hydrogenation of coal. We are satisfied that this is the correct policy. It does not preclude the use of tars as they become available in suitable quantity and at suitable prices. In fact, we foresee a definite field for tar hydrogenation as well, which should be of great assistance to the carbonization industries. Large-scale commercial development of our hydrogenation process now only waits upon progress in regard to a limited number of economic factors. When that is achieved, we shall be prepared to invest a substantial sum out of our present liquid resources upon this enterprise."

Freedom for Council House Tenants

After a very full hearing a Committee of the House of Commons have agreed to the main clause of a Bill promoted by the Gas Light and Coke Company. The facts of the case will be found fully set forth in this issue and the two immediately preceding numbers of the " Journal." From this report, it will be seen that the principal object of the Bill is to prevent housing authorities within the Company's area of supply imposing conditions upon their tenants concerning the form of light, heat, power, or energy they may use. No fewer than forty local authorities appeared in opposition; and though they constituted less than half the total number within the Company's area of supply, they included the London County Council, the Middlesex County Council, and the Metropolitan Boroughs of Battersea, Hackney, and Stepney. The clause as it appeared in the Bill originally drafted was in the following terms, and in agreeing to it the Committee have added the proviso which is printed in italics:

> A housing authority shall not in or in connection with the selling, leasing, letting, or other disposal of any building or part of a building or land for the time being belonging or leased to them and being within the limits of supply make or impose any term, condition, or restriction with respect to (i) the form of heat, light, power, or energy to be supplied to or used in any such building or any part thereof or on any such land or in any building erected on any such land; or (ii) the taking from any particular local authority, company, body, or person of any form of heat, light, power, or energy; &c.
>
> *Provided that nothing in this section shall apply to any reasonable term or condition as to the position in any room or other part of a building of any fittings required for the use of any form of heat, light, power, or energy.*

A Bill of the Commercial Gas Company, which was promoted with a similar object, was also down for consideration by the same Committee; but in view of the decision in the Gas Light and Coke Company's case, the local authorities who had petitioned against the Commercial Gas Company's Bill decided to withdraw their opposition, at the same time reserving their right to oppose in the House of Lords, should they desire to do so.

The policy followed by many local authorities in restricting the freedom of Council house tenants in the manner objected to by these and other Gas Companies has occupied a good deal of " Journal " space at intervals since 1925, when the Newport (Mon.) Corporation promoted a Bill which led the Newport Gas Company to ask for the insertion of a provision to the effect that the Corporation should not impose, under the powers of that clause, any term, condition, or restriction in respect of the form of light, heat, power, or energy to be used in buildings erected under the Act. On that occasion the Committee inserted the provision for which the Gas Company asked. From this beginning things went on until last year, when the Kettering Gas Company were successful in obtaining an Act prohibiting the Kettering Urban District Council imposing restrictions of a like character.

Safety First

Though with the passing of time increased attention is paid to the slogan " Safety First," there can be no doubt whatever that there is still room for very much greater care on the part of most people in going about their daily affairs. For example, the number of persons known by the police to have been killed or injured by vehicles and horses in streets, roads, or public places in Great Britain during the year 1932 was 213,117. This total was nearly 5000 more than in the preceding twelve months; while as recently as 1926 the figure was very much smaller at 138,774. It is true that the fatal accidents in 1932, which resulted in 6667 deaths, show some trifling improvement upon 1931, when the victims numbered 6691; but however they may be regarded, the statistics are appalling in their magnitude, calling aloud for any possible remedial measures. And one of these remedial measures obviously is still wider realization of the importance of regarding life's activities from the " Safety First " point of view.

Regard for a few moments another aspect of this vital matter—accidents in industry, to the minimizing of which the National " Safety First " Association is devoting so much energy. Just think of it! Taking the country through, of the 6,913,974 persons employed in industrial establishments during 1931, no fewer than 379,671 suffered injury, and in 2295 cases the results were fatal. Authoritative opinion is to the effect that 75% of industrial accidents are attributable to the human factor, the remaining 25% being due to mechanical causes. The National " Safety First " Association exists to reduce the 75% figure.

In 1927, the Home Office issued a Draft Order, calling on the chief accident producing industries to provide for the institution of special safety arrangements. That Order has never been confirmed, because industry, through its respective federations, responded by giving an undertaking to the Home Office that it would volun-

tarily promote organized accident prevention. Subsequent reports of H.M. Chief Inspector of Factories are claimed to show that this undertaking has been successfully carried out. It is felt that a substantial reduction of industrial accidents will be more satisfactorily achieved by voluntary co-operation of workers and management than by compulsory regulations.

The National "Safety First" Association is co-operating with the Industrial Welfare Society to assist industry along these lines, and one of the main methods adopted is the poster, which it is argued is the psychological basis of accident prevention work. It prepares the mind of the worker for voluntary co-operative effort, and depicts how accident causes can be eliminated. Numbers of impressive posters are issued by the Association; and in these the danger of sepsis receives more attention than any other hazard, while fire risks are also dealt with.

Various other services are offered by the National "Safety First" Association, of Terminal House, 52, Grosvenor Gardens, London, S.W. 1; and the statistics quoted earlier in this article sufficiently emphasise the necessity of taking the fullest advantage of every possibility that may be afforded of reducing the present toll of death and suffering.

PERSONAL

The Minister of Health has appointed Mr. J. S. CARTER, M.Sc., Ph.D., F.I.C., to be an Inspector under the Alkali, &c., Works Regulations Act, 1906. He has been assigned to the London and South-Eastern Counties District, with Headquarters in London.

* * *

Mr. FAIRFOUL THOMSON, of Messrs. Alder & Mackay, Ltd., has announced his intention to retire from business at the end of June, on account of the state of health in which his illness of three years ago has left him. Mr. Thomson has represented the firm in London for over 30 years, and has been with them for a total of 47 years. He will carry with him the good wishes of a large number of friends in the Industry.

* * *

Owing to the rapid expansion of the Romford Gas Company's business, and in view of the valuable services rendered to the Company for many years by both the Engineer and Manager, Mr. JOHN COMPTON WRIGHT; and the Secretary and Commercial Manager, Mr. GEORGE BERRIDGE, the Directors submitted a recommendation to the stockholders, at an extraordinary general meeting last week, that these officers should be elected as additional Directors of the Company. This was unanimously adopted, and at a subsequent Board meeting Mr. Wright and Mr. Berridge were also appointed Managing Directors of the Company.

* * *

The Melrose Gas Company has appointed Mr. ROBERT J. GAVIN Engineer and Manager in succession to Mr. JAMES GEMMELL, who has retired after 34 years' service. Mr. Gavin has been Chief Technical Assistant to Kirkcaldy Gas Department for the past six years.

* * *

The late Mr. ALEX. YUILL, retired Gas Manager, Dundee, and formerly of Alloa, left £17,552.

OBITUARY

The death took place on April 7, on the eve of his 49th birthday, of Mr. JOHN FRANCIS CROFTS, who had been Manager of the Stone Gas Company for the past fourteen years. Before taking on this position he was Assistant Manager at Fenton Gas-Works.

Institution of Gas Engineers

Provisional Programme for 70th Annual General Meeting

Tuesday, May 30.

10. 0 a.m. to 12.15 p.m.	(*a*) Civic Welcome and Opening of 70th Annual General Meeting at St. George's Hall, Liverpool. Welcome to Representatives from Overseas. 70th Annual Report and Accounts. Presentation of Medals. Presidential Address by Mr. Ralph E. Gibson, M.Inst.C.E., M.Inst.Gas E. Paper by Mr. R. W. Hunter, M.Inst.Gas E., on "The Coke Oven Plant at Beckton Gas-Works." (*b*) Ladies' Tour of Liverpool.
12.30 p.m.	Photograph.
2.15 p.m.	Paper by Dr. W. Beck on "Electrolytic Corrosion in Gas Mains."
3.15 p.m.	Scrutineers' Report of Ballots.
3.30 p.m. to 6.30 p.m.	Visit to and Tea on the M.V. "Georgic" (27,000 tons).
9. 0 p.m. to 2. 0 a.m.	Reception and Dance at Philharmonic Hall, Liverpool.

Wednesday, May 31.

10. 0 a.m.	Lecture, illustrated by Experiments and Lantern Slides, by Prof. W. A. Bone, D.Sc., Ph.D., F.R.S., on "The Photometric Analysis of Explosion Flames."
11. 0 a.m.	Paper by Mr. Arthur H. Barker, B.Sc., M.Inst.C.E., M.I Mech.E., on "Heating Buildings by Gas."
12 noon to 12.15 p.m.	General Meeting of the Benevolent Fund; Annual Report and Accounts.
12.30 p.m.	President's Luncheon to the Council at the Adelphi Hotel.

Wednesday, May 31 (*continued*).

10. 0 a.m. to 12 15 p.m.	Ladies' Visit to Port Sunlight.
2 30 p.m. to 6.30 p.m.	(*a*) Visit to the Garston Works of the Liverpool Gas Company. (*b*) Visit to Jacobs' Biscuit Factory.
7. 0 p.m.	Council Dinner to the President at the Adelphi Hotel.
9. 0 p.m. to 2. 0 a.m.	Civic Reception and Dance (by invitation) at the Town Hall.

Thursday, June 1.

10. 0 a.m.	Paper by Mr. George Evetts, M.Inst.C.E., M.Inst Gas E., on "Centralized Manufacture and Long-Distance Transmission of Gas in Belgium."
11. 0 a.m.	Paper by Mr. Joseph E. White, A.M.I.Loco E., on "The Development of Gas as an Industrial Fuel."
12 noon to 12.15 p.m.	Concluding Business.
12 30 p.m.	Southport: Visit and (by invitation) Civic Luncheon.

Friday, June 2.

North Wales Tour: Luncheon at Oakwood Park Hotel, Conway, and (by invitation of Dr. G. C. Clayton, C.B.E., J.P., M.P.) tea at Crabwall Hall near Chester.

Saturday, June 3, to Friday, June 9.

Whitsun Cruise on S.S. "Lancastria" (17,000 tons), leaving Liverpool at 7 p.m. on Saturday, June 3, for Oporto and Corunna and returning to Liverpool at 3.30 p.m. on Friday, June 9, 1933.

[The Institution Headquarters will be at the Adelphi Hotel, Liverpool.]

THE NEWS OF THE WEEK

Following an Unsuccessful Attempt to get the charge of 8d. per unit for street lighting reduced, Crieff Town Council are to consider a motion to revert to gas for street lighting in the interests of economy.

At a Meeting of the Yeovil Town Council on Monday, April 10, it was announced that the Ministry of Health had sanctioned the raising of a loan of £26,159 for a proposed new gasholder and other improvements and extensions.

A **" Radiation " Clinical Lamp** is to be offered by the Bradford Corporation Gas Committee to the Baths Committee, free of charge, for the treatment of rheumatic and similar diseases at the Medical Department of the central baths.

The Manchester District Association of Gas Engineers will hold a Special Meeting at Leeds on Friday, May 19, when a visit will be paid to the City of Leeds Industrial Gas Department, followed by a paper on " Industrial Gas," by Mr. E. A. Leask, Leeds.

A Feature of the Opening of the new Hampton Court Bridge, when a crowd of 2000 people took part in, or witnessed, a procession of decorated vehicles at midnight, was that, although the Middlesex approach was illuminated by the Hampton Court Gas Company, the Surrey Side—Molesey has changed to electricity—was in complete darkness.

Messrs. Alder & Mackay, Ltd., have been officially appointed by the Minister of Local Government as contractors to all local authorities in Saorstat Eireann for the supply of gas meters and street gas lamps for twelve months to March 31, 1934. The Company assemble all meters sold in Saorstat Eireann at their Branch, Kyrl's Quay, Cork.

Extensions are Being Made at the St. Helens Gas-Works, including a waterless gasholder, 200 ft. high, with a capacity of 2 million c.ft. The output of the works has been increased 71% during the last eleven years, and the make is now 943 million c.ft. per year. When the extension has been completed and some addition has been made to the existing carbonizing plant, the works will be capable of producing 5 million c.ft. of gas per day.

Negotiations for the Purchase of the Conisborough Gas Undertaking indicate that a sum of £500 per annum for several years would be required to put the distribution system into good condition. There is apparently considerable scope for the development of the sales of gas in Conisborough—many new houses have been built without a gas supply at all—and the Rotherham Gas Committee are satisfied that this extension of the Rotherham gas area will prove to be to the advantage of the gas consumers of both Conisborough and Rotherham.

The Lighting of Rugby.—At a recent meeting of the Rugby Town Council the question of entering into a new agreement for street lighting with the Rugby Gas Company for a period of ten years was discussed. It was stated that the estimated annual saving on the existing agreement would be £745, and if seasonal lighting in the added areas was abolished the saving would be £649. The question was raised as to why the town, which was such a large electrical centre, should be content to be lighted by gas, and eventually the matter was referred back to the committee for further consideration.

An International Congress on Accounting will be held in London from July 17 to 21. The congress is the fourth of an international series to be held, and the first of them to take place in London. It is being held primarily to discuss various aspects of accountancy. British accountants will be given the opportunity of discussing the methods of accounting as practised in other countries, and foreign delegates of all nationalities will get some idea of methods in this country. It is expected that there will be at least 200 visitors from overseas. Particulars may be obtained from Public Information Bureau, 23, Bream's Buildings, Chancery Lane, London, E.C. 4.

Quoting What Could be Done by every employee of the Undertaking acting as a propagandist for gas, Mr. Charles Murlees, Chairman of the Wrexham Gas Company, speaking at a meeting of contributors to the employees' superannuation fund, mentioned that fitters were recently asked to carry a gas poker and to give demonstrations of its use whenever they had an opportunity. As a result over 60 of the pokers were sold. Employees could all do a tremendous lot to help forward the Company's business, not only by carrying out their duties conscientiously but also by pushing gas for all it was worth. The outside men could be particularly helpful in that respect, as they were in constant contact with the customers, and had many opportunities for recommending the use of cookers, gas fires, water heaters, gas irons, and other appliances. The Company would shortly be organizing a special campaign to popularize the use of gas water heaters for which there was a tremendous field.

The " Metro-Log " Treatment.

The " Metro-Log " gas fire is essentially a proper treatment for a fireplace of this description, and the illustration shows an attractive setting in the " Gale " House (furnished and decorated by the " Woman's Journal ") at the Ideal Home Exhibition, Olympia.

Fighting the Smoke Menace.

On Monday, April 10, a meeting of local authorities in the Merseyside and South-West Lancashire District, held at Liverpool, decided to form a Regional Advisory Committee for this area to deal with the smoke problem.

As a result of the efforts of the National Smoke Abatement Society, similar Advisory Committees, which have for their object the more uniform administration of the law relating to the emission of smoke, and educational work, including classes for stokers, have already been established in the Midlands, the Manchester District, and London.

Dr. W. M. Frazer, Medical Officer of Liverpool, Alderman W. Melland, Chairman of the National Smoke Abate-

THE NEWS—continued.

ment Society, and Mr. Arnold Marsh, Secretary of the Society, were the chief speakers.

It is hoped that as a result of a memorandum addressed by the Society to 130 local authorities, similar committees will be set up for Tyneside, Tees-side, North-East Lancashire, and the Potteries.

A Suggested Lancashire Amalgamation.

Mr. J. H. Clegg, Burnley's Gas Engineer, is the author of a proposal to amalgamate the Gas Undertakings of the Burnley, Nelson, and Colne Corporations. On April 1 the transport undertakings of these authorities came under joint control, to facilitate their running and economize on running expenditure. Mr. Clegg has followed this up with a proposal to do the same with the Gas Undertakings, and his report, which was presented to a Sub-Committee of the Burnley Corporation, was favourably recommended to the full Committee, with a view to approaching Nelson and Colne Corporations on the proposal.

It was decided to invite the Nelson Corporation to appoint representatives to confer with the Burnley Committee, and the Nelson Town Clerk has made a request to be supplied with detailed information to enable the Nelson Gas Committee to form an opinion as to whether any useful purpose can be served by such amalgamation.

Hydrogenation of Coal.

In his address to shareholders at the general meeting of Imperial Chemical Industries, Ltd., last week, Sir Harry McGowan, Chairman, said that the Company had continued research work on hydrogenation with marked success.

" Much," he continued, " has been written in the Press on the economics of the process, particularly in comparison with low-temperature carbonization. These comments have necessarily been based only on costs, &c., which I myself made public some eighteen months ago, and they clearly cannot make due allowance for the great strides we have since made. There is no foundation for the general suggestion that the direct hydrogenation of coal is unsound economically by comparison with carbonization of the raw coal first, followed by the hydrogenation of the resulting tar.

" Our technical staff is still working on the direct hydrogenation of coal. We are satisfied that this is the correct policy. It does not preclude the use of tars as they become available in suitable quantity and at suitable prices. In fact, we foresee a definite field for tar hydrogenation as well, which should be of great assistance to the carbonization industries. Large-scale commercial development of our hydrogenation process now only waits upon progress in regard to a limited number of economic factors. When that is achieved, we shall be prepared to invest a substantial sum out of our present liquid resources upon this enterprise."

Oil from Coal.

At a meeting in Glasgow of the Scottish National Development Council, Mr. Robert Maclaurin asked that the Executive Committee should immediately form a Committee to inquire into the possibilities of producing oil from British coal.

He said we would require to carbonize 100,000,000 tons of coal to produce 8,000,000 tons of oil, and the capital cost would be close on £100,000,000. We could not produce oil economicallly in this country, however, unless we could get an outlet for gas, and he was anxious that the Committee which he proposed should look into the question of developing a gas " grid " for the whole of Scotland to provide the needed outlet.

Provided that outlet was available, we could manufacture oil at a price of about 3d. per gallon, at which price we could prepare to electrify our railways on the Diesel oil system.

The total expense for a gas " grid " for Britain would be something like £400,000,000, including carbonization plant, and would be expended very largely in mains and other metal work, which would give a very much-needed fillip to the iron and steel industry.

We would have a smokeless Scotland, Mr. Maclaurin concluded. At present we do damage to the extent of about 15s. for every ton of bituminous coal that we burn in the raw state. If we saved even 10s. a ton of that it would mean about £50,000,000.

The Executive Committee, which met subsequently, decided to remit Mr. Maclaurin's proposal to the Chairman's Committee for consideration.

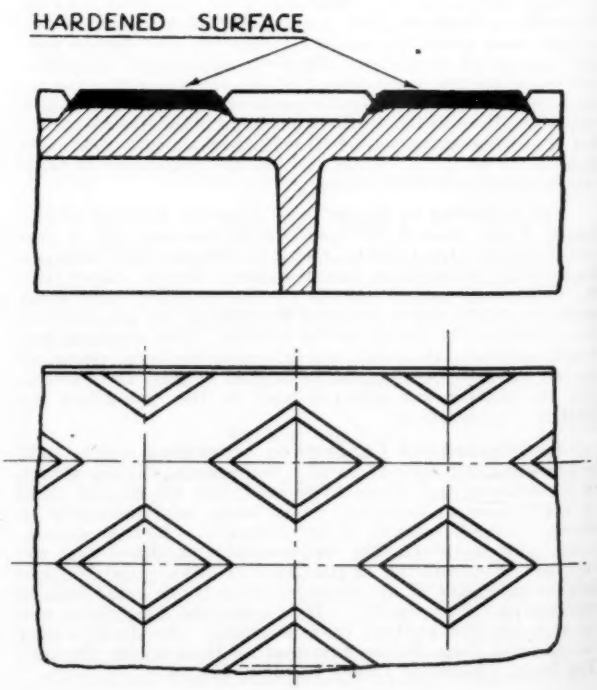
" Hard-Stud " Road-Sections

Stanton Company's New Process

An important development in the manufacture of cast-iron road-sections has recently taken place as a result of research work by the Stanton Ironworks Company, Ltd., near Nottingham. The diamond-shaped studs forming a non-skid surface on the Stanton Iron Road are, by means of a new process (patent applied for), now provided with a hardened outer layer. This layer extends throughout the greater portion of the depth of the studs.

The close, hard structure of the studs is obtained by locally changing the composition of the iron during the casting operation, by treating the portion of the mould forming the studs with certain chemicals. This combination of a hard and durable surface with the soft grey metal forming the rest of the casting gives the section a far greater resistance to shock than could be offered by a casting made and chilled in the ordinary way. In addition to preventing skidding in all weathers, the studs form a natural drainage system. With their increased resistance to wear, the useful life of the section is greatly prolonged.

The Stanton Company claim that their new process, which is a unique feature of the continuous casting methods used in the manufacture of Stanton cast-iron sections, is the only known method of satisfactorily hardening the studs. They have experienced considerable success with their cast-iron road-sections, which are designed to resist exceptional attrition, and are, therefore, suitable for such points as 'bus-stops, wharves, docks, railway-platforms, and loading-floors. The Stanton Iron Road has now been adopted by many municipalities and private companies; and there is no doubt that the new " Hard-stud " feature will still further recommend it to the consideration of engineers and surveyors.



Gas Instead of Oil.

Sir William Morris, addressing the League of Industry Conference at Oxford, said he had done his best to mitigate the present state of unemployment in this country. He had done his best for the coal industry. At his works at Birmingham in the last twelve months they had given a contract for 100 million c.ft. of gas to be used in place of oil.

That was going on through all his organizations, and it was being done so that they might use the products of this country instead of the products of the foreigner. He was doing his best to persuade others to do the same.

Northampton Gaslight Company.

The Northampton Gaslight Company, stated the *Financial Times*, in a recent "Potential Investments" column, was incorporated by Special Act in 1923. In recent years operations have undergone considerable expansion, chiefly by the acquisition, as from the beginning of 1928, of the undertaking of the Weedon Gas Light Coke and Coal Company, while from the beginning of 1931 the Towcester Gas and Coke Company was absorbed, involving the issue of stocks to the shareholders thereof, an increase of capital, &c. In December last the Company applied for a special order to acquire the Long Buckby Gas Light Coke and Coal Company.

The statutory area of supply covers some 160 square miles, comprising thickly populated industrial and rural districts. The maximum price of gas is fixed at 14d. per therm and the price at December, 1931, was 10d. Dividends are not subject to a sliding scale.

In spite of continued depression in trade gas sales have steadily increased, and mains have been extended to housing estates and several more villages.

The dividend requires just under £20,000. On account of the current year the half-yearly dividend of 2½% was paid in February. The amount of the authorized capital is £456,083, of which there is issued £399,141 in 5% maximum consolidated stock (including £24,983 net discounts). At the current quotation of 103 the yield per annum is 4⅞%. The stock has received its maximum dividend regularly since 1905.

The unissued capital can be raised as ordinary or preference stock, with a dividend not to exceed 7% in either case, or as consolidated stock with dividend not to exceed 5%. Borrowing powers are equal to one-half of the paid-up capital, including premiums. At the beginning of the current year £49,900 of 6% and £47,000 of 7% debenture stocks were redeemed and their place taken by an issue of £96,900 of 5% stock, redeemable at par in 1972, thereby effecting a considerable saving in interest. The whole issue was sold at 102%, less commission.

There remains outstanding £51,250 of 4% irredeemable debenture stock and £35,000 of 5% stock, 1941, making altogether a loan capital of £183,150.

The new 5% stock is at present quoted at about 113 to return 4⅜% per annum.

Plastic Materials in Industry.

The Plastics Industrial Exhibition was opened at the Science Museum, South Kensington, on Wednesday, April 5, by Mr. H. Ramsbottom, M.P., Parliamentary Secretary, Board of Education.

This Exhibition is the first of its kind ever held and will certainly provide food for thought. The display is intended to suggest, by example, how plastic materials can be employed with benefit in many industries which at present do not use them at all, or only to a small extent. Included among these are many basic industries which experience trouble with better known materials now employed; among such industries are coal mining, metallurgy, ship building, automobile, aircraft railway, and other heavy engineering.

The term "plastic material" covers a number of natural and artificial chemical products which have the property of taking shape or form under pressure. The earliest plastic, celluloid, dates from 1864, while casein (obtained from milk) was first made in 1900. Latterly, a group of synthetic resins has been produced from which innumerable articles are now made.

More than 1000 exhibits are shown demonstrating the use of plastic material in nearly eighty industries—mostly of post-war birth. It is illustrated how almost everything from cogs for machinery, aircraft accessories, and railway sleepers down to "wooden" tables, "china" vessels, and unbreakable domestic appliances, can be rendered in plastic material. There is a specially designed room where the comparatively new technique of using laminated plastic sheets is illustrated on a very imposing scale. In this room the panelling, doors, table, and other effects are carried out entirely in laminated material.

Visitors to the Exhibition are able to trace the development from the earliest raw material in each type of manufacture, through the intermediates, to the finished moulding powder or sheet that forms the boundary between the chemical and the more technical side of the work.

The Exhibition, which is to last for six months, has been organized by the Plastics Group of the Society of Chemical Industry in conjunction with the British Plastics Moulding Trade Association. Throughout the duration of the display a number of lectures by experts in the industry will be given.

An Attractive "Lumetro" Setting.

This photograph shows a corner of the sitting-room of the "all-gas" Coombe House at Olympia. Genial warmth is provided by a "Lumetro" gas fire, enamelled to harmonize with the overmantel and surround. Lighting is provided by panel-type wall brackets and a standard lamp. The fire is controlled by a "Metro" standard tap which is so convenient to operate. A pilot light and ash tray are also provided.

Annual Social Gathering at Rotherham.

The Annual Social of the Rotherham Gas Department was held in the Bridge Inn, Rotherham—Mr. J. T. Haynes (Engineer and Manager) presiding, supported by a large gathering, which included Alderman R. Kirk (Chairman of the Gas Committee), Councillor A. E. Barlow (Vice-Chairman), Councillor G. C. Ball, and Mr. J. H. Holroyd (Distribution Superintendent).

An interesting and instructive feature of the gathering was the display of extremely clear cinematograph films by Mr. Haynes, which showed scenes at the inspection of the new 'bus shelter in All Saints' Square, and at the following firms: Messrs. J. J. Habershon & Sons, Ltd. (showing gas furnaces in production of steel strip), the Rotherham Forge and Rolling Mills (showing gas furnaces in production of spring steel and motor flywheels, &c.), the Don Forge (showing coal furnaces converted to gas), the British Automatic Refrigerators (showing new gas-fired stoving furnace), the Gas Offices and Showrooms, and a gas-driven 'bus and lorry being charged with gas.

Councillor Ball said he had greatly appreciated the pictures shown by Mr. Haynes. He (Councillor Ball) had a deep interest in the future of gas undertakings. The time

THE NEWS—*continued.*

was not far distant when the whole of the gas undertakings in the country would undergo revolutionary changes.

Mr. Haynes said the Gas Undertaking was one of the most prosperous concerns in Rotherham. He did not think that any undertaking in Rotherham could say that during the past two years they had increased their output by 25%. The Gas Undertaking had also increased the permanent staff of employees by 25% apart from temporary workmen. If every firm could say the same, Rotherham would be a brighter place. Trade in Rotherham was definitely beginning to improve. The more gas that was used, the less would be the smoke produced and the better would be the health conditions of the people.

Alderman Kirk referred to the great advantages of sociability and unity between employers and employees. He would never agree to any profits in the Gas Department being handed over to the relief of the rates. They knew only too well to-day that they were having to remedy some of the mistakes of the past, and the handing over of profits to the relief of the rates had been one of them. As Chairman, he would prefer to see any profits when not used in renewals, &c., utilized in increasing the wages of the workmen and in the reduction of the price of gas to the consumers. Industrially and domestically there was a great increase in the use of gas, and that meant that more men would be required, thus affording relief in unemployment in the Borough.

Manufacture of Gas Fire Radiants.

The *Ironmonger*, in their issue of April 8, described a visit to the works of British Foundry Units, Ltd., of Retort Works, Chesterfield, a newly-formed Company which took over the manufacture of gas fire radiants from Messrs. J. & J. Dyson, of Chesterfield. The materials from which they are produced are essentially clays and stone, from sources widely separated—*i.e.*, Cornwall, Stannington, Derbyshire, and from certain parts of the Black Country.

These are ground and mixed in one operation by means of an electrically-driven grinding and mixing machine. The mixture is standard and has been arrived at by both experiment and research and is regarded by the proprietors as giving undoubtedly the best results of any, and capable of producing the best radiants on the market. After the clays are mixed the material is passed on to the moulding presses, which are operated by girls. The old ball pattern fuel used to be made, and still is made, in a two-piece mould in which the radiant is moulded round a plunger and the whole brought together under a press. The newer pillar type is made in four-piece moulds, two pieces being used for the back and two for the front, and then the whole is pressed together. Later in the stage of manufacture the radiants are carefully tested for size, but these dies themselves have to be within very narrow limits of accuracy. We might note, in passing, that although the pillar pattern is almost universally in demand in these days, the ball pattern is not entirely obsolete, and we were told that quite recently an order for 10,000 of this type was completed.

When the radiants have been moulded they are of a slate grey colour and they are laid out in trays which are placed on racks, through which steam-heated pipes pass. They remain on the racks for twenty-four hours to dry. Then the pattern is picked out by girls, removing the surplus clay which is not taken out in the mould, by hand—a small pocket knife being used for the purpose. Then the radiants have to be packed preparatory to being baked. They are taken in boxes arranged in what are known as " saggars," earthenware containers of about 12 in. diameter and about 10 in. deep, which will take on an average 47 radiants. In order to make up a heat, about 650 of these saggars are filled with radiants. They are then packed in the kiln, which is about twelve yards long, in rows of five, nine high. This kiln has a brick floor, a downward draught, and ten fire holes. The kiln is fired up, and the radiants are baked for about twenty-six hours. Cooling takes another day. They are then removed. The radiants on being removed have attained their white, biscuit colour. Each is tested in a gauge for the right width, and, should it be too wide, the edges are ground on a small stone to within 3/1000ths of an inch. They are also tested for right set or stand. It has been found with most fires that it is advantageous to let the radiants fall slightly backward, and, in order that this should be so, the bases are ground to an angle of two degrees, which gives them the slight tilt which prevents them falling out of the fire.

There are possibly a score of different patterns of radiants for gas fires, and we were interested to see what is perhaps the latest development, the facing of the radiants of some patterns, particularly the bow pattern, with a hard enamel. This is done quite easily by hand dipping the face side in a narrow trough of special preparation before they are baked. In the process of baking, this sets hard, giving a beautiful glossy coat. After being tested and adjusted, the radiants are ready for packing and distributing.

Gas for Transport in Lincoln.

After a visit of inspection to the Chesterfield Gas Department by representatives of their own Gas Committee and Transport Committee, the Lincoln Corporation have decided that a gas compressor be installed at the Bracebridge Gas-Works, Lincoln, and that a lorry belonging to the Gas Department be converted into a gas-driven vehicle.

At the meeting of the City Council at which these decisions were made, Councillor Bower observed that the cost of running gas-propelled vehicles was half that of petrol-driven machines. He suggested that at some future date gas lorries should be used to convey a supply of gas to the villages, where it could be stored in small holders and distributed to local consumers in the ordinary way. Villagers would thus be given an easy and cheap opportunity of using gas in their homes.

In reply to a critic, Councillor J. K. Fox said that if all the Lincoln Transport Department's 'buses were run on gas it would mean that £6500 per annum would go to the gas department instead of about twice that sum to the petrol combine.

Councillor Bower, in reply to a query, said the cost of converting the 'bus from petrol to gas-power would be £100.

Water Pollution by Cyanides.

The Water Pollution Research Board has published its Report for the year ended June 30, 1932 (H.M. Stationery Office, price 1s. net).

In this it is stated that the survey of the River Tees is now far advanced and data are now being correlated for the preparation of the final report. Considerable attention during the past two years has been devoted to the systematic observations of the death of salmon and smolts at various periods and to examining the different kinds of effluents and their effect on the river and on fish life. It was definitely shown last year that as far as the migration periods of 1930 and 1931 were concerned, the deficiency of dissolved oxygen in the estuary water was not, by itself, sufficient to cause the death of smolts. It was consequently concluded that the fish had probably been poisoned by directly toxic substances. Later experiments and observations prove that the most important effluents, as regards toxicity, were those produced either by the washing and cooling of crude coke oven gas or during the distillation of crude ammonia liquor resulting from the carbonization of coal.

" The effluents from the distillation of ammonia liquor owe their toxicity almost entirely to the tar acids they contain. On the other hand the effluents derived from installations of coke ovens in which ammonia is recovered by the so-called direct process contain relatively small quantities of tar acids, and their toxicity is due principally to the presence of cyanides. Both tar acids and cyanides have been found in a large number of samples of water taken from positions in the estuary at which smolts were killed in 1930 and 1931. None of these samples contained tar acids in concentrations sufficiently high to be toxic to smolts, but many of them contained cyanides in lethal concentrations."

The Report states that " it has been definitely concluded that during the migration periods of 1930 and 1931, the mortality of smolts in the estuary of the Tees was caused primarily by the toxic action of cyanides contained in coke oven effluents. This conclusion marks a distinct step forward, for, so far as is known, it has never been previously suggested that cyanides are responsible for the death of fish in the Rives Tees."

The Report continues, " The question at once arose as to what steps could be taken to prevent the admission of cyanides into the river. . . . The two most promising methods suggested were first examined in laboratory experiments made in co-operation with I.C.I. (Fertiliser and Synthetic Products), Ltd., Messrs. Dorman, Long, & Co., Ltd., and the Cargo Fleet Iron Company, and were later tried on a semi-technical scale at a coke oven plant where facilities were provided by Messrs. Dorman, Long, & Co., Ltd. These experiments have shown that coke oven effluent containing cyanide can rapidly be rendered innocuous when tested in 1% solution by mixing it with pre-determined quantities of spent pickle liquor and lime, or the cyanide can in large measure be removed by spraying the

heated effluent in the form of a fine mist. It is interesting to note that spent pickle liquor is obtained as a waste product from certain processes of cleaning iron and steel, and at the present time it is discharged in appreciable quantities into the River Tees, when the ferrous chloride it contains is oxidized and precipitated without affecting the cyanides which may be present."

The Report points out that, in estimating the effect which toxic substances will have if discharged into an already polluted stream, it is important to consider the nature of the substances already present. The addition of a concentration of a new poison not sufficient to kill the fish does not always appreciably alter the toxicity of the stream, but if the same poison or one with which it is interchangeable is already present, the toxicity of the stream may be increased considerably.

"During the year a further study has been made of the factors affecting the rate of disappearance of toxic substances in estuary water. The accelerating action of sewage on the decomposition of phenolic substances under aerobic conditions is very striking. The rate of disappearance of cyanides under similar conditions does not, however, seem to be accelerated by the presence of sewage. In this connection it has been found that cyanides, even in small concentrations, partially inhibit the decomposition of sewage, while tar acids are themselves decomposed."

Report of the Public Prosecutor on the Neunkirchen Explosion*

The Public Prosecutor (Staatsanwalt) of Saarbrücken has concluded his inquiry, and the following appeared in the "Saarbrücken Zeitung" of March 28 as his report.

The inquiry has been concluded, as it could not be found that any definite persons could be held to be responsible and liable to prosecution. On the day of the accident—*i.e.*, February 10—the holder was inspected inside by a foreman and workman. No irregularities of any description were found, and the holder itself had been working the whole time before the accident without interruption.

The by-pass main which formed a direct connection between the inlet main and the outlet main was to be cleaned, as naphthalene had separated and settled in the gas main. For this purpose, about two weeks before the accident the by-pass main was put out of operation. On the side of the inlet main it was closed by means of an existing valve and on the side of the outlet main by the fixing of a blank flange.

The cleaning operations in the by-pass were carried out by the workshop and not by the coke ovens to which the gasholder belonged. Before starting the operation the necessary safety measures were discussed by the leading employees of the two departments. Naphthalene is taken out by a steam process, and the necessary work on the by-pass (several metres in length, resting on supports at some height above the ground) created difficulties. Part of the by-pass was dismantled, and cleaned on the ground so that only the work on the remaining part of the by-pass was done in its original position. This procedure was all the more necessary, as the main showed a few defects which had to be welded. Welding was first of all done by the autogenous process, and later also by the electrical process.

This work was finished on the day prior to the accident. The dismantled mains were replaced on the supports during the forenoon of the day of the accident. A defective part of the re-erected main was electrically welded. In the course of Friday the men were occupied in closing the flanges of the mains, this work being practically completed in the afternoon. At one point in close proximity to the valve new packing rings had to be put in. This work, in itself entailing no danger, was entrusted to two workmen operating at intervals under the supervision of a foreman. When the men had inserted the packing rings and were going to close the flanges at this point it was found that the part of the main coming from the valve had sunk, and that therefore the flanges did not meet. After talking the matter over with the foreman the men decided to sink that part of the main coming from the blank flange by taking away the cradle on the support on which the main rested. To remove the cradle the workmen applied hammer blows at this point, and also the autogenous welding apparatus, which was still lying there, so as to reduce the protruding part. The foreman had meanwhile gone away. From the evidence of the two men (both were saved: one, however, was seriously injured, and both have suffered nervous shock) it cannot be taken for certain whether welding or hammering was the last act. According to the actual findings—the cradle has been found—the last operation was welding. In any case the first minor explosion took place at this moment and at this point. This explosion was positively caused through the work on the cradle, and almost with certainty through the welding operation.

The gas and air mixture which exploded had formed in the by-pass main, still closed up, towards the inlet and the outlet mains. Therefore either the blank flange or the valve was leaky. The blank flange could not be found. The valve has been smashed by the explosion. As far as ascertainable it was, however, firmly closed and controlled during the working operations. It would also be possible that the valve, either during the erection work or through hammer blows, was damaged and became leaky. The sinking of the main from the valve would lead one to such supposition.

The findings show that a gas-air mixture above the piston exploded. Whether with such findings prosecution comes into question has been negatived by the Public Prosecutor.

No breach of any factory regulations has taken place and no reproach can be made against the supervising employees, as the necessary safety measures were taken at the commencement and during the repair work, and as fires near gasholders or gas-filled mains have so far not been considered as prohibitive. The fixing of the packing rings in itself was quite a simple piece of work with no danger attached, and this work would probably have been done without any untoward event if the unexpected sinking of a part of the main which led the men to the dangerous work had not taken place. There was no occasion for any special supervision during the fixing of the packing rings.

On the other hand, no reproach can be made to the men from the workshop department for doing the work they had themselves decided upon at the last moment and which work led to the preliminary explosion, seeing that the men had witnessed the work and had actually taken part during the whole time in the welding work on the main. Through the practical closure of the by-pass main the danger was increased, as even with the smallest leakage in the valve or blank flange an explosive gas and air mixture would form. That extra care was required in working with a flame even near the main on the cradle was not to be known by simple workmen, and they certainly did not anticipate trouble, as they themselves were exposed to the greatest danger to their lives.

The accident is therefore due to a combination of events for which no definite person can be legally held responsible.

* From "Das Gas- und Wasserfach" (No. 14, 1933—8.4.1933).

XUM

The Better Utilization of Coal

A Symposium on the Utilization of Coal was held at the Royal Institution, London, on March 27, at the instance of the British Science Guild. Mr. H. T. TIZARD (Rector of the Imperial College of Science, London) presided.

Four papers were read, among them being one by Capt. Bernard Acworth and another by Mr. Stephen Lacey. We give extracts of these two papers.

ECONOMIC SIGNIFICANCE OF COAL.

By CAPTAIN BERNARD ACWORTH, D.S.O., R.N.

[EXTRACT.]

By the institution of the Electricity Board, by the electric grid, and other means, electricity has been "socialized." Furthermore, public authorities in many cases make the use of electricity compulsory in subsidized houses, to the detriment of gas, if, indeed, they do not actually cement up the gas pipes. The healthy rivalry that should exist between oil and electricity generated by coal is being stifled by the growing combination of diesel electric propulsion on sea and land. Such a combination enjoys, therefore, the advantage of subsidy in both components.

On the other hand, subsidized electricity has been directed into uneconomic spheres of long-distance lighting, heating, and cooking, thus invading the natural province of unsubsidized gas.

City traction, the truly economic outlet for electricity in bulk, has been usurped, without protest, by subsidized petrol vehicles, the working cost of which, per seat mile, is more than double that of the electric car, even though the track of the car is a charge on the vehicle, whereas the track of the 'bus is a charge on the ratepayer.

During the past few months the growing anxiety over our national fuel policy has given rise to increased propaganda for the institution of national schemes for obtaining oil from our own coal resources. Any attempt, however, to remove the strategical and economic dangers involved in our present oil policy by national projects for obtaining oil from our own coal resources must involve the legislative interference and subsidy which have inflated the foreign oil bubble.

To obtain oil by the hydrogenation of raw coal is technically possible, as has been known for years, but as an economic proposition it is fantastic, as Mr. Tizard and other disinterested persons have so conclusively shown.

Low-temperature carbonization will give approximately 20 gallons of tar oil from which fuel oils can be produced, as we all know, and as has been known for generations, but to obtain by this process sufficient oil for the peace requirements of the Navy, disregarding merchant ships and transport, would involve the production of low-temperature solid fuel on a scale at which the imagination boggles. Conducted, however, as a private enterprise, without subsidy and without inspired legislation, low-temperature carbonization has undoubtedly a considerable future if the solid fuel is treated as the main product.

An expanding demand for smokeless domestic fuel, and for producer gas, will gradually make available an increasing supply, on an economic basis, of fuel and lubricating oils derived from low-temperature tar. In short, the use of natural or synthetic oil as fuel on a great scale is incompatible with genuine private enterprise, and thus with sound economics.

By subsidizing oil we have, for a generation, been subsidizing excessive, and therefore uneconomic, speed, personal convenience, personal preference, and, on an enormous scale, sudden death.

When we turn from the "new industries" based upon, or interlocked with, oil, to the basic industries parasitic to coal, we find that these, so far from enjoying legislative favours, have provided in rates and taxes a large proportion of the subsidies from which foreign oil benefits. The railways throughout the world are in competition with motor vehicles and aircraft. The railways are approaching insolvency and the coal industry is on the brink of bankruptcy.

FUTURE OF THE COAL AND COAL GAS INDUSTRIES.

In turning to the future of coal and of the Gas Industry I shall naturally assume a complete cessation of the legislative favours enjoyed by oil in the past, and very particularly of those subsidies to road transport and flying which are the keystone in the arch of the oil industry. I shall assume, in short, that the pure economics of fuel are allowed to operate naturally without the bias of subsidy and inspired legislation. Under such conditions of recovered freedom and fairness the output of coal must necessarily increase to a point never before reached in the history of this country.

At sea, in men of war and merchant ships alike, coal burnt in the raw state, whether stoked by hand, by mechanical grates or in pulverized form, will recover its universality.

Unsubsidized electricity, divorced from the subsidized diesel, will be generated by steam raised in coal-fired boilers stoked, as at sea, according to circumstances. Because electricity transmitted over long distances is absurdly uneconomic, the super-power station will give way to a great number of small local stations, the main output of which will be absorbed by up-to-date electric cars in all our cities and towns, the small residue being used for lighting and cooking in the immediate neighbourhood by those who prefer electricity to gas, and are prepared to pay for it.

In a world set free from legislative favours and interference, a great expansion in the use of gas for lighting, cooking, and heating can confidently be predicted. With a fair field and no favours an expanding demand for gas in cities and towns is assured, but its extension throughout the rural districts is as desirable as it appears to be practicable if the principle of compression is largely developed.

A high-pressure gas reservoir in country houses and cottages seems to provide a self-contained and clean source of heat, light, and power, superior to the coal cellar with its attendant labour and dirt. Coke prepared and thus popularized for suitable open grates can quickly be ignited from the gas reservoir. More attention should be given to the perfecting of domestic anthracite cooking stoves and automatic anthracite heating apparatus, both of which, for cheapness and efficiency, can hardly be equalled.

Speaking as a layman, but as one who from boyhood has been accustomed to the handling of compressed gases and the internal combustion engine in submarines and torpedoes, I can hardly doubt that gas derived from coal is the motor fuel of the future. To make it readily available in garages throughout the country will clearly need a great organization, but what the oil industry has so brilliantly achieved can be accomplished by the Gas Industry with equal success.

DEVELOPMENT OF THE USE OF GAS.

By STEPHEN LACEY, B.Sc., M.Inst.C.E.

[EXTRACT.]

When nearly a century ago George Stephenson said that the "strength of Great Britain lies in her coal beds," there was no serious competitor of coal as a natural source of heat and power. To-day conditions are very different, since oil challenges the supremacy of coal. Nevertheless, the dictum of George Stephenson still holds good because the real wealth of this country must continue to depend largely on full use being made of its coal resources—even though, for a limited time, the truth may be obscured by the complexity of international trade.

To what extent the increasing importation of oil fuel could be artificially controlled with advantage is arguable, but all must agree that whether action is taken in that direction or not, continued progress in regard to the efficient utilization of coal is of vital importance to this country.

And that brings me to the subject with which I am chiefly concerned in this symposium—namely, the advances that are being and can be made in the technique of gas utilization, with which I should couple coke utilization, because the complementary fuels, gas and coke, are both derivatives of the carbonization of coal. In passing I should like to remind you that the part played by the Gas Industry as an instrument in the efficient utilization of coal is almost invariably under-rated. The Industry is 120 years old, and it is natural, perhaps, that an Industry thus well past its centenary should lose a good deal in its popular appeal. The investor has grown to take for granted the security of the 200 millions sterling invested in gas supply undertakings, and equally the consumer takes for granted the arrival of gas at the tap.

Fortunately for the community the Gas Industry thrives in spite of its lack of novelty, and will continue to thrive, given enterprising and unfettered development, because its economic basis is sound. In the first place the carbonizing process as carried on in gas-works and coke oven works is the most efficient known means of converting coal into smokeless and convenient forms of heat.

Of the total coal tonnage used in Great Britain, about 10% (18 million tons) is carbonized in gas-works; raw coal used for domestic purposes represents 25%; and about 5%

is used for electrical generation. The thermal efficiency of the carbonizing process is such that about four-fifths of the heat in the coal is potentially restored to the community in the shape of gas, coke, and tar, in the proportions of 5 to 10 to 1. In other words, of 100 heat units in the raw coal, about 25 are recovered in the gas, 50 in the coke, and 5 in the tar—the loss on conversion being about 20 units.

It will be understood that utilization efficiencies have also to be taken into account in calculating the percentage of the heat in the raw coal effectively used by the consumer. Potential heat, either as raw coal or in some form derived from coal, is delivered to the community, and the proportion of this heat usefully recovered depends on the character of the fuel and its method of application.

Taking into account overall utilization figures, which can only be estimated approximately, the conclusion is arrived at that two tons of coal, one used directly for domestic purposes, and one for electrical generation, will together yield only the same amount of useful heat as one ton treated in a gas-works, without having regard to tar and other products not used as fuel.

The relatively high overall thermal efficiency of the fuels derived from the carbonizing process gives an initial advantage to this method of utilizing the potential heat of the coal resources of the country, and has an important bearing on coal conservation. But thermal efficiency is only one factor affecting cost and convenience, which are the two chief considerations determining the value of a fuel to the consumer.

The two most important cost factors affecting the price of fuels derived from coal are the cost of conversion, or generation, and the cost of distribution. And in both these respects the Gas Industry is in a relatively strong position. The net cost of gas up to the point where it leaves the gas-works is of the order of 3d. per therm where the works are too far from the coalfields to take a supply of gas from coke ovens. This is very much less than the equivalent cost of the generation of electricity in terms of heat units; and the cost of distribution is also in favour of gas.

In support of these statements I quote the following passage from the Fuel Research Board's Report of 1919: "The sheet anchor of the Gas Industry of the future must necessarily be its possession of the cheapest known means of distributing heat in a convenient form. For lighting and power production the electricity supply in the future may seriously contest the field with the producers of gas, but for the supply of heat gaseous fuel ought to remain supreme if its production and use are developed on sound lines."

Scientific research in connection with gas utilization is very active and there are many laboratories throughout the country engaged upon the development and perfection of appliances and fittings for both domestic and industrial purposes. The modern gas appliance is not the result of trial and error, but is a scientifically designed instrument, the behaviour of which in operation can be anticipated precisely. Ability to carry out the required operation with the minimum quantity of gas is recognized as the only sound basis for a steadily increasing demand for gas by the public. Wastage of heat during utilization must be reduced to a minimum, and the last decade has seen an immense development in the use of thermal insulation in connection with gas appliances.

For the country as a whole, the heat requirements for general manufacture are probably more than twice those represented by the domestic field. That this sphere has not been neglected by the Gas Industry is shown by the fact that over half the gas output of some supply undertakings is used for industrial purposes, and in London alone gas is used in some two thousand trades with an average of seven processes in each. Where a rational use of heating processes is required and fuel economy is fully considered, gas is increasingly being introduced. In its application to industrial purposes scientific research is bearing its part with such good results that the introduction of gas will often considerably reduce the cost of a process, and at the same time lead to more consistent results and a greater throughput.

Full advantage is taken of thermal insulation, heat recovery and automatic control not only of temperature but also of the oxidizing or reducing character of the atmosphere which, in the case of metallurgical and ceramic work, may be of prime importance. Gas finds economic application in processes as varied as precious metal melting at the highest range of industrial temperatures and the drying of celluloid where low controlled temperatures are essential.

Just as the scale of industrial heating processes tends to be larger than domestic heating operations, so are the advantages of gas so used as a fuel magnified, whether it be in respect of reliability of supply, absence of harmful waste products, cleanliness and release of storage space, precision of heat control, or overall economy.

As an example of the fact that the Gas Industry is fully alive to the possibility of gas being used for new purposes, I refer to the investigations that are being made in regard to compressed gas for motor vehicles in place of petrol. There are no insuperable technical difficulties in the way. In fact, gas has several important advantages over petrol; ease of starting the engine and complete combustion, for example—and the possibilities of future development in the field of motor traction depend on such factors as the cost of gas compression, the cost and weight of vehicle equipment, and last, but most important, the amount and certainty of the continuance of the import duty on petrol.

The time available prevents my making more than passing reference to the utilization of coke. Great advances are being made in the preparation and grading of "high temperature" cokes. In the last ten years hundreds of thousands of domestic coke boilers have been installed for the provision of hot water and partial central heating, and during the last few years "high temperature" cokes have come to be used in specially constructed open fire grates with gas ignition. But a great deal remains to be done, particularly so far as the larger central heating boilers are concerned, in minimizing the chief disability of coke—shared by all other solid fuels—in regard to the labour involved in charging the boilers and removing the ashes.

The failure to keep abreast of the times by taking advantage of the possibilities of hopper feeding of the fuel, automatic regulation of combustion and thermostatic control, is partly responsible for the disturbing increase in the use of fuel oil in circumstances where home produced smokeless solid fuels could be used at no greater cost, taking capital cost, labour, and running cost into account.

It would naturally be thought that those responsible for central heating installations in new, and old, buildings in this coal country would be most reluctant to use oil. But the bias often appears to be in favour of oil, people behaving as if there were some special virtue in saving labour, even where no real economy is effected thereby.

In conclusion I would say that the coal industry should look upon gas and coke, if they take a long view, not as competitors, but as allies in the face of competition with imported oil.

Discussion.

Dr. E. F. Armstrong, F.R.S., said the fact which must be faced was that the consumption of coal was decreasing while that of oil was increasing, and in his opinion the reason could be stated briefly. It was because the oil industry was so much more efficient than the coal industry. While the oil industry was co-ordinated and well organized, the coal industry consisted of a number of units or sections which were not co-ordinated and organized. Taking the coal industry from beginning to end Dr. Armstrong said that in the first place it was essential for the colliery to be efficient, but when there were quota systems which meant the industry had to carry inefficient collieries, then there was a handicap at the very start, which should be removed. The mines themselves should also be technically efficient, but that could safely be left in the hands of the engineers and technical people. Next, when the coal had been brought to the surface it must no longer be regarded as something in which the colliery owner had no interest except in selling it as it came up. The coal must be prepared into its most suitable forms. It should be cleaned and so save an enormous amount on transport, because 10% of ash meant that one truck out of ten was useless material, but had to be paid for in transport charges, in inefficient use, and also afterwards by way of ashes to be carted away. Further, coal should be regarded much more than it was from the point of view for which it was to be used. One of the gas companies maintained a research station in the Newcastle area for the examination of about 2,000,000 tons per annum, and this cost an extra ½d. per ton; but it had been found well worth this extra expense, because the coal was probably worth shillings per ton more as the result. Incidentally, his view was that the burning of coal in the domestic grate was barbaric, and he hoped a younger generation would grow up which might be able to boast that it had never seen a coal fire. Discussing the advantages of oil over coal, Dr. Armstrong said it was more flexible, but coal could be made more flexible by turning it into gas or electricity. The case that had been put forward by Mr. Lacey for gas had been put forward with confidence because Mr. Lacey knew he represented an Industry which had done its duty. Why did not the coal industry recognize that its best friends were the gas and electricity industries and treat them in that way instead of treating them as milch cows? That was a thing which must be put right; if the cost of gas and electricity could be reduced this meant a greater consumption and, consequently, a larger demand for coal. Mr. Lacey had said that gas cost 3d. per therm into the holder, and as the charge was 8d. or 9d. to the consumer in London, there was a charge of 5d. per therm for distribution. The therm was the equivalent of about 29 electrical units, and the electrical unit cost less than ½d. at the power house. Thus there was an enormous addition in respect of distribution, and this was responsible for keeping up the costs of these commodities. Perhaps if those in the gas and electrical industries spent a little less time competing among themselves and telling the public how wonderful they were, and a little more time and energy on reducing distribution costs, it would be a benefit all round. Again, coke was a very flexible

form of fuel; and although efforts were being made to grade and standardize it, which had resulted in increased sales, more should be done in this direction. When put into a modern boiler, coke burned without any attention.

Mr. H. L. PIRIE (Technical Department, Coal Utilization Council) said that much valuable information regarding pulverized coal burning equipments, colloidal fuel, low-temperature carbonization, &c., was already available, and the Council hoped to show that coal, properly utilized in modern equipment, was the cheapest, safest, and most economic fuel.

A SPEAKER pointed out that whereas the coal production in this country at the present time was nearly 70 million tons less than it was in 1913, the extent to which oil was replacing coal was only 2 million tons per annum, and this included many purposes for which coal was technically unsound and inadmissible, such as where heat control was of paramount importance. As to the suggestion that oil was subsidized, the fact that the Government last year took £35,000,000 from the petrol tax hardly suggested a subsidy.

The CHAIRMAN, in bringing the meeting to a close, said that more nonsense had been spoken with regard to the utilization of coal in the last few years than had ever been the case with any other problem of national importance. It had been said that coal had the great disadvantage of producing fog in the atmosphere, but he sometimes wished it did not produce so much fog in the mind. What were the problems which had to be faced? The facts were that less coal was being produced and sold in England to-day than was the case a few years ago, and, of course, there were also numbers of unemployed miners. These were grim facts, it was stated, but why the reduction in the output of coal should be regarded as a grim fact he did not know, because it seemed to him that first principles suggested that our natural capital resources such as coal should be used as sparingly as possible. Therefore, the fact that we were using less coal than formerly did not stir him, as a fact. It was, however, necessary to go a little further into it to discover the reasons, and the main reason was that in many directions coal was being used much more efficiently. Then there was the grim fact of unemployed miners, but it must not be overlooked that there had, coincident with the reduced consumption of coal for the reason he had stated, been a period of general industrial depression coupled with an increased use of oil. These coincidences had been joined, and people had said that our supremacy as a nation, based on coal, was passing because less coal was being used and oil had come in. Was there, however, really anything in that argument? If there was anything in it, we should have expected to find those countries which happened to be large owners of coal and oil, and large exporters of both, in a highly prosperous state, while the countries which produced no coal or oil would be expected to be in the most depressed state, and to have a very much lower standard of living. Denmark and Italy had been quoted as countries which had been competing successfully against us in certain manufactures. These were countries which had neither coal nor oil, but nobody had suggested that they were in a very much more depressed state than ourselves. Therefore, it was unnecessary to assume that, because two things happened at the same time, one of them was the cause of the other. The great industrial depression through which we were passing had very little to do with technical developments. Nearly ten years ago he was told that one of the great troubles in industry in England was that the latest applications of science were not being made use of. Now people said that industrial depression was due to the fact that the scientist and the industrialist had gone ahead too fast. They could not have economists and politicians changing their minds in ten years in this way, and giving entirely opposite reasons for the same phenomenon. Personally he believed the present industrial depression was due to the inherent failure and inherent weaknesses in our financial distributing system; and when those weaknesses had been discovered and remedied, some of the problems that had been discussed in the Symposium would automatically disappear and the coal industry would advance. He did not propose to discuss the papers, but Capt. Acworth had rather misinterpreted his views in stating that he (Mr. Tizard) had referred to hydrogenation of coal as a fantastic scheme. What he had said was that it was inexpedient and inadvisable at the present time, which was rather a different interpretation.

[The British Science Guild has published in booklet form a full report of the discussion, together with the papers presented at the symposium. The price of the booklet, which is obtainable from the Offices of the Guild, 6, John Street, Adelphi, London, W.C. 2, is one shilling.]

National Gas Council

Meeting of Central Executive Board

A Meeting of the Central Executive Board of the National Gas Council was held on Tuesday, April 11, at 28, Grosvenor Gardens, London, S.W. 1. In the absence of Sir David Milne-Watson, the Chair was taken by Mr. Wm. Cash, J.P. (Vice-Chairman).

Draft Annual Report.—This was approved for submission to the 15th Annual General Meeting to be held at the Hotel Metropole, Northumberland Avenue, W.C. 2, on Wednesday, May 10, 1933.

Joint Standing Finance Committee.—The recommendations of the Joint Standing Finance Committee of the National Bodies, which met on March 21, were approved and adopted.

Private Bills.—The position was reported with regard to the Bills before Parliament promoted by (*a*) the Gas Light and Coke Company, and (*b*) the Commercial Gas Company, which sought to prevent housing authorities from imposing restrictions as to the form of heat, light, power, or energy to be used in buildings. It was stated that the Committee on Private Bills which had been considering the Bill promoted by the Gas Light and Coke Company had unanimously decided in favour of the Company, and that in view of this decision the Local Authorities opposing a similar Bill promoted by the Commercial Gas Company had decided to withdraw their opposition, while retaining their right to oppose the Bill when it came before the House of Lords.

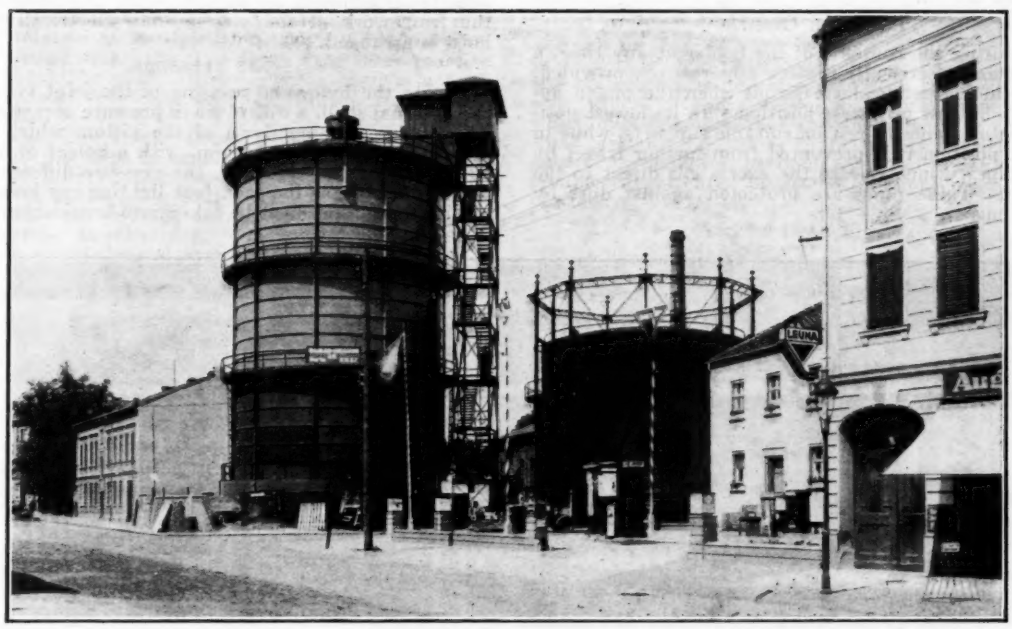
Gasholders and Alleged Danger to Aircraft.—It was reported that, in response to an invitation from the Air Ministry, Mr. Ogilvie, on behalf of the Conjoint Conference of Public Utility Associations, and Mr. Hardie, on behalf of the National Gas Council, had attended an informal conference at the Air Ministry on March 6 in connection with the subject of "obstructions in the neighbourhood of aerodromes." The view was accepted by the Air Ministry that no differentiation should be made between Public Utility Undertakers and the owners of other "obstructions" in regard to the matter of illuminating such obstructions. Mr. Ogilvie and Mr. Hardie had promised that the representations put forward by the Ministry would be carefully considered, and the Central Executive Board agreed to remit the matter to the Conjoint Conference.

Gas Meter Re-verification.—It was reported that the attention of the Council had been drawn to a memorandum prepared by the Manchester City Justices, putting forward a basis of re-verification which could in no circumstances be acceptable to the Industry. Members were invited to communicate to the Officers of the Council any similar proposals which came to their notice.

Association of Public Lighting Engineers.—A letter was read from the above Association, drawing attention to their forthcoming Conference at Margate to be held on Sept. 4 to 7 of this year, and inviting the Council to send delegates. It was agreed that Mr. C. S. Shapley (City of Leeds Gas Department) should represent the Council at the Conference, and it was stated that the Institution of Gas Engineers had already appointed two delegates.

Export of Coke.—It was reported that the Council had asked the Mines Department to be permitted to appoint a representative to help the Ministry in the national negotiations with the Governments of Scandinavian countries in so far as they related to the export of gas coke to those countries, and that the Ministry had acceded to this request. As the great majority of the coke exported came from London, it was agreed to remit the matter to the London and Counties' Coke Association for them to appoint the representative.

The Bamag Dry Gasholder



THE NEW BAMAG-MEGUIN CIRCULAR WATERLESS GASHOLDER AT THE MUNICIPAL GAS-WORKS AT BERNAU, NEAR BERLIN.

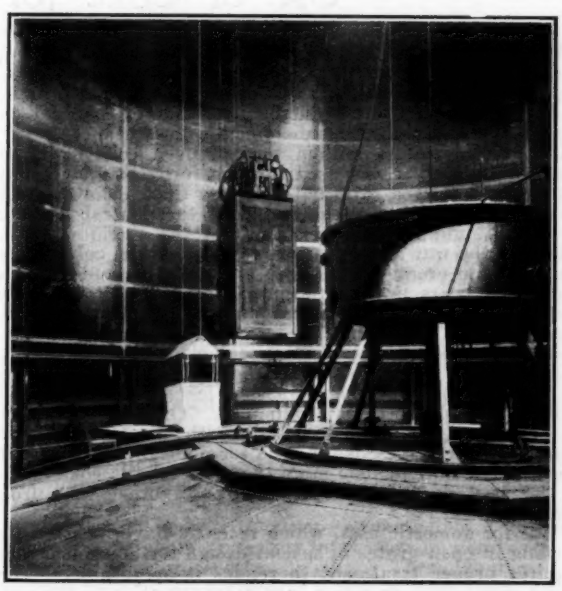
In the "JOURNAL" for Feb. 8 we gave an account of the gasholder built at the Berlin Bernau Gas-Works. A more detailed description has been sent to us by Bamag-Meguin (Great Britain), Ltd., and this should be of interest to our readers.

The holder shell consists of 5 mm. thick plates, all plates carefully rolled and bored. The shell is stiffened externally by vertical columns which are connected together by circular gangways. The seams are stiffened by T-iron or similar sections. The vertical columns are provided with large supporting feet, which are rigidly connected to the concrete foundation at the bottom, in order to take up all wind stresses and transmit them to the foundation.

The tank roof consists of a braced framing, according to the design of Professor Schwedler or the Binder system. The domed roof can either be covered with 3 mm. steel plates or a light covering of roofing paper on a wood framing, or similar construction. In the middle of the roof is a ventilation dome, the openings in which are protected against the coming in of dust by a bronze screen. The lighting of the interior of the holder is by a number of sky-lights fitted with wire glass. The bottom of the shell rests on the concrete work and is constructed of 3 and 5 mm. thick plates. The gas piston can be constructed either as a dome or flat disc. Around the rim of the piston are two joint rings, consisting of leather tyres of U-section, which are fixed to the steel plate construction. These two tyres are delivered ready for fixing, so that it is only necessary to bolt them in position at the site, and to connect the ends. The tyres are filled with oil, which flows under pressure from small tanks mounted on the piston, so that the tyres are pressed gas-tight against the steel wall of the shell. The operating pressure is about 3 to 5 ft. head of oil. Only one of the two joint-rings is in continuous operation, the other acting as a spare for use when the main tyre is to be changed.

The tyre is very flexible and works satisfactorily in spite of any distortion of the shape of the steel gasholder shell. The material from which it is made has a natural porosity, so that a small quantity of oil continually passes through it and continuously lubricates the sliding surface between the leather and the steel shell. Any excess oil flows to the bottom and is connected in a trough round the shell, from which it flows to a small connecting tank outside the shell. Thence it is periodically pumped, after purification, to a tank arranged at the top of the shell, and then flows to a small pressure holder on top of the piston to be again used. The porosity of the two tyres for a holder of 3½ million c.ft. capacity is about 440 gallons per 24 hours. This quantity of oil can, of course, be dealt with in a few minutes by a small pump. The mineral oil required should have a congealing point of 40°, flame point of about 160°, and a viscosity of 50° of about 2 and at about 2° of about 7. Specific gravity, 0·918. The joint tyres have a fluid pressure of 3 to 5 ft. head for satisfactory operation, and it is therefore not necessary to provide any loading levers, &c., on the piston. The construction is therefore simple and easily controlled.

The attention required in operation is almost negligible and the oil consumption is similarly of no importance. The piston is provided with a number of rollers arranged in two tiers one above the other, and at such a distance that a tipping or jambing of the piston cannot take place. The top rollers are supported by a suitable steel construction



VIEW OF INTERIOR OF HOLDER,

Showing part of top of piston with the central tank which feeds oil to the two sealing tyres. To the left is seen the electrically-operated hoist to enable workmen to reach the top of the piston. Adjacent is a small hand-operated lift for emergency purposes.

from the piston. All rollers are arranged above the piston joint, are adjustable, and can be attended to or replaced during operation. The working of the piston both up and down is very smooth and even. The material of the joint tyres (specially prepared leather about 5 mm. thick) is well preserved by the oil.

Indicator Gear.

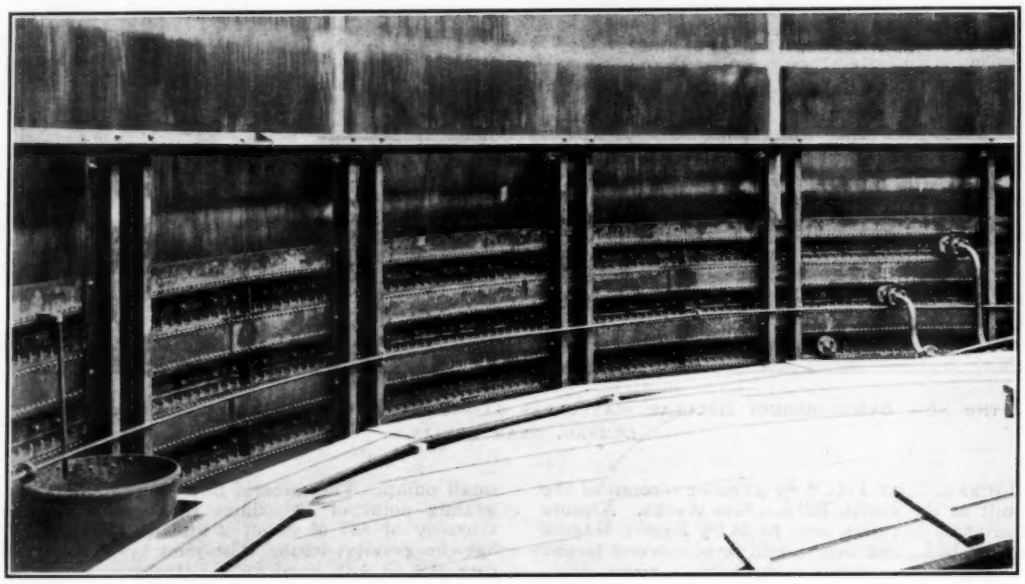
For measuring the contents of the holder at any time, a mechanical and electrical indicator apparatus is provided, which also indicates by alarm signal when the piston approaches its highest or lowest position. In its lowest position, the piston comes to rest on suitable supports, while in the highest position it is prevented from further travel by gas relief pipes, which release the excess gas direct to the atmosphere. These pipes are protected against dust by bronze screens.

Staircases and Hoists.

For giving access to the piston, an electrically operated hoist is arranged inside the holder, and, in addition, a simple hand operated hoist is provided as spare. For giving access to the various circular gangways round the outside of the shell, an easy staircase is provided. Inside the framework of the staircase an electrically operated hoist is arranged.

Gas Pressure.

Due to the hydraulic pressing of the joint tyres against the external shell, a difference in pressure occurs due to the going up or coming down of the piston, which has been estimated to be about 10 mm. with a holder of 3·5 million c.ft. capacity. In addition, the pressure difference due to the column of gas for each foot lighting-gas height equals about 2 mm., and must be taken into consideration.



INTERIOR VIEW OF THE BAMAG-MEGUIN HOLDER,

Showing part of the top of the piston and of the surrounding framework, to the outer surface of which the sealing tyres are attached.

Use of Coke for Domestic Purposes

The Institution of Mining Engineers, Utilization of Coal Committee, have given us permission to publish the following memorandum, which is one of a series of memoranda dealing with developments in the utilization of coal and its bye-products, issued to members of the Institution:

In 1914, of the 11 million tons of oven coke made in Great Britain 86% was used in blast-furnaces and 6% in foundries; 6% was exported and less than 1% was used for "domestic" purposes (including the central heating of public buildings).

During the war new uses were found for oven coke. The markets then created have since gradually expanded until, during the years 1928-30, the proportion of the coke made that was used in blast-furnaces had dropped to 65%; 13% was exported, and about 16% was used for domestic purposes. In 1931, the production of coke decreased owing to the decline in the production of pig-iron, but the amount used for domestic purposes was not less than in 1930 and formed 26% of the total production. The export market was also well maintained, mainly with the Scandinavian countries, where the coke is used for domestic heating. It is estimated that in 1932 more than 50% of the coke made in the Midlands was used for purposes other than iron smelting.

Coke for domestic uses, which recently have included its burning in open grates of special design for house heating, requires proper treatment to render it acceptable. The object of this Memorandum is to draw attention to the properties most desirable in coke offered for sale for domestic use.

Importance of Sizing.

For all small-scale operations, among which may be included forging, brazing, and the melting of non-ferrous metals, in addition to central and domestic heating, the efficient use of oven coke is dependent on its close sizing. For the development of the domestic market, the provision of correctly graded coke is essential.

It is recommended that for the preparation of the larger sizes of coke—*i.e.*, between 3 in. and 1 in.—a uniform difference of ¼ in. between screens should be adopted, so that the standard grades of size would be: 3 to 2½ in.; 2½ to 2 in.; 2 to 1½ in.; and 1½ to 1 in. For coke of less than 1-in. size a narrower grading—*e.g.*, 1 to ⅝ in. and ⅝ to ⅜ in.—may be desirable.

The size of coke, thus graded, that can most effectively be used depends to a certain extent on the size of the combustion chamber, but, in general, as large a size as possible should be used—*e.g.*, 2½ to 2 in. coke should be used in preference to 2 to 1½ in. if the size of the combustion chamber permits of the larger size settling uniformly in the fuel-bed. For this reason, it is important that the screening plant used for the preparation of the graded coke should be efficient.

With small combustion chambers, such as those of domestic water boilers or stoves, the range of size of oven coke that can be used with success is narrow. Thus, with the fire-box of a water boiler measuring but 9 by 9 in., and burning not more than 3 lbs. of coke per hour, a size of oven coke greater than 1½ in. is usually unsatisfactory. The grade should be 1½ to 1 in.

When a slow rate of combustion is required, the combustion is maintained more readily the smaller the size of the coke. Thus, for a small slow-combustion stove, a fire of 1 to ½ in., or ⅝ to ⅜ in., coke would readily keep alight throughout the night, whereas it would die out if the coke were larger. On the other hand, provided that the combustion can be maintained with a larger coke, as it can

be in large stoves, the larger grades are easier to handle, require less draught, and are less liable to cause trouble through clinkering.

"Reactivity."

The "reactivity" of a coke is an important property as regards its use for domestic purposes and must be considered in relation to its size. Thus, for a given purpose, a smaller size of oven coke than that of the more reactive gas coke should be used. Because oven coke is not, in general, so reactive as gas coke, it requires to be more closely graded.

Oven cokes differ among themselves in their reactivity, dependent on the type of coal used in their manufacture, the coals of lower carbon content usually yielding the more reactive cokes. The admixture of a non-coking or poorly coking coal with the coking slack renders the coke more reactive. A coke of high porosity, such as is obtained from a top-charged oven, is more reactive than a dense coke. On the other hand, cokes made from medium coking coals that are cake-charged are the more heavily fractured, and such cokes can be "cut" to small nut size with but little wastage.

In general, Derbyshire cokes are more reactive than those of Yorkshire, which, in turn, are more reactive than Durham cokes, but the differences are not great and can be discounted by differences in grading as to size.

Effect of Moisture.

The smaller the size of coke the higher, in general, is its moisture content, unless it has been obtained by "cutting" or "cracking" large coke.

Moisture in coke causes it to crackle on combustion, the moisture being discharged from the pores as steam. A disadvantage of a high moisture content arises from the presence of coke dust in the quenching water. As the coke dries during storage after delivery to the consumer, this dust falls off and concentrates at the bottom of the storage bin. An aggregation of the dust charged to a boiler would be liable to cause trouble through clinkering, while its presence suggests poor screening and prejudices the user against oven coke. Effective filtration of the quenching water, and the use of as little water as possible, are remedies against this nuisance.

Effect of Ash.

When a coke is burnt to provide a source of bright radiation for heating a room, its ash content is of considerable importance. Accumulations of the ash mask the radiation from the fire, which loses its cheerful appearance. The low reactivity of coke, as compared with coal, for example, renders it particularly important that the ash it contains shall not interfere unduly with its combustion. Frequent poking of the fuel-bed to discharge the ash below the grate may be helpful, but this has the disadvantage of consolidating the fuel-bed.

When coke is used in closed stoves which are not intended to provide a source of intense radiation, the amount of ash is of less importance than its physical condition and its fusibility. A dense ash is preferable, since it readily becomes detached from the burning coke and thus does not impede combustion. In coke-heated boilers for central heating, having deep fuel-beds, a bulky ash may accumulate in a layer offering too high a resistance to the passage of air to allow of the combustion being maintained at the desired rate.

When the rate of combustion of coke per square foot of grate area is high, its ash may fuse and form clinker. The size of the clinker depends mainly on the fusibility of the ash, which, if very fusible, may form large aggregates which impede combustion and are difficult to remove from small grates. Clinker is more readily formed when the coke is of small size, particularly if it is dusty, and clinker trouble can often be overcome by supplying a larger size of coke.

Coke in Open Fireplaces.

Coke does not burn satisfactorily in a well-grate because the fuel-bed is too shallow, and there is insufficient draught. A good draught is required to burn coke because of its low reactivity. A fuel-bed 6 to 8 in. deep should be used. In some designs of grates for burning coke there is a subsidiary flue, behind a false back, to which excess of air cannot penetrate. By arranging communication, after refuelling, between this back flue and the top or bottom of the fuel-bed, the rate of combustion can be temporarily increased so that a bright red fire is rapidly re-established.

Access of air to the coke is promoted by using widely-spaced bottom fire-bars and sloping the lower portion of the front fire-grid inwards; or the fire-back can be similarly sloped. By such an arrangement, the settling of the coke-bed towards the zone of most rapid combustion allows loose ash to become detached.

It is particularly important with a coke fire that heat should not be conducted away from the sides and back, and these should be well insulated with fire-brick.

Summary and Conclusions.

The market for domestic coke can be more profitable than the metallurgical coke market, particularly during times of depression in the iron and steel industries. At such times, also, the domestic coke market can provide means of disposal of small coal produced at the collieries. Similarly, the market for coke for forging, brazing, and the melting of non-ferrous metals can be developed.

Coke for central heating plants has to meet the growing competition of oil. Careful preparation of the coke, therefore, of the correct quality and grade for particular conditions, is necessary to satisfy the consumer.

The most important requirements are the accurate grading of the coke according to size and the provision of a wide range of sizes. The coke should be free from dust, and the moisture and ash contents should not be high.

It is recommended that the following standard grades of size should be adopted: 3 to 2½ in.; 2½ to 2 in.; 2 to 1½ in.; and 1½ to 1 in. For coke of less than 1-in. size a narrower grading—*e.g.*, 1 to ⅝ in. and ⅝ to ⅜ in., may be desirable.

NOTES ON PLANT AND PROCESSES

Cellactite Roofing.

In drawing up their new catalogue on the subject of cellactite roofs and vertical cover, Messrs. Cellactite and British Uralite, Ltd., of Lincoln House, 296-302, High Holborn, W.C. 1, have devoted the greatest attention to placing clearly before architects, engineers, and buyers of structural materials the essential facts and practical considerations which give cellactite its unique position. The information set out in the catalogue is not merely theoretical, but is based on years of successful use under the most varying and often rigorous conditions.

Cellactite is a material designed and made specially to meet modern requirements for roofing and vertical cover. It is an imperishable compound of high-grade asbestos and asphalt, consolidated by pressure with a steel core—so that the steel is permanently sealed from all corrosive influences—and finished in the form of standard corrugated sheets. It requires no painting or other protection. It is stated to be permanent against corrosive atmosphere—industrial or otherwise—while tropical sun or arctic cold leave it unaffected.

In the actual process of manufacture, steel cores are thoroughly cleansed, dried, and then immersed in a bath of highly protective and chemically inert molten bitumen. This bitumen has a very high melting point, and is quite unaffected by any temperatures met by sheets in use, even in the tropics. The bitumen envelope, though tough and rubber-like, and completely resistant to weather, acids, &c., is only a first protection to the metal. Being tenaciously adhesive, it permanently bonds the later coverings to the steel base.

Special machinery produces the cellactite coverings, consisting of an upper and an under sheet of asbestos-asphalt felt. These must conform to a rigid specification, and before use are subjected to exacting tests. The coverings receive accurately controlled heat treatment and are then applied to the already protected steel base, under a pressure of 3000 tons. The sheets so produced undergo trimming, finishing, and mechanical treatment, which seals the edges perfectly and uniformly.

The resultant cellactite sheet—strong, light, and resilient, yet completely resistant to weather and corrosion—is then ready to proceed to the store. Throughout manufacture cellactite is subjected to rigorous inspection. The material is uniform and the sheets as finished have a hard glossy surface, their substantial and robust covering presenting high resistance to accidental abrasion.

Typical applications of the material are shown by means of photographs in the catalogue, while a section indicates the very attractive colours in which the sheets can be finished.

XUM

Gas Light and Coke Company's Bill

As announced in our last issue, the Committee of the House of Commons which considered this Bill for some days decided to pass Clause 4, which prohibits local authorities who are housing authorities from placing restrictions upon the use of gas or electricity by their tenants with the following proviso:

> Provided that nothing in this section shall apply to any reasonable term or condition as to the position in any room or other parts of a building of any fittings required for the use of any form of heat, light, power, or energy.

As we also mentioned last week, this had the effect of causing the large number of local authorities who were opposing the Commercial Gas Company's Bill on the same issue—and which was to have been considered next by the Committee—to withdraw their opposition although reserving their right to oppose in the House of Lords should they desire to do so.

Some time was then devoted by the Committee to a consideration of Clause 5 of the Bill, which seeks to empower the Gas Light and Coke Company to lay trunk mains between its Beckton Works and the eastern portion of its area towards Southend. To do this, however, it will be necessary to pass through the northern portion of the Romford Gas Company's area which at the moment is something in the nature of a wedge between the western and extreme eastern sections of the Gas Light and Coke Company's large area. It was mentioned by Mr. Tyldesley Jones, K.C., on behalf of the Gas Light and Coke Company, that the Romford Gas Company oppose this clause first because it was stated the district was too crowded for large trunk mains of the nature contemplated to be laid, and, secondly, because apparently there was a fear in the minds of the Directors of the Romford Company that the Gas Light and Coke Company would obtain powers to supply gas in Romford. This latter had never entered the heads of the promoters, and the Bill would be made perfectly clear on that point. As regards the suggestion that the district was too crowded, Counsel pointed to the fact that none of the local authorities concerned raised any objection to what the Company now proposed, and clearly any trunk main would only be laid where there were suitable facilities for it.

Mr. *Stephen Lacey*, Distributing Engineer to the Gas Light and Coke Company, gave evidence, and said it would probably not be necessary to lay more than one 24-in. main, and facilities to do that through the northern part of the Romford Company's area would enable gas to be supplied to the Brentwood and Southend area from Beckton, if need be. The minimum size main likely to be laid would be 18 in. in diameter. The distributing mains required by the Romford Company for local distribution would not need to exceed 8 in., and there would be no difficulty in providing accommodation for such mains in the vicinity of any trunk main laid by the promoters, because obviously they would not choose an already crowded route to lay such a trunk main.

Mr. CRAIG HENDERSON, K.C., who appeared on behalf of the Romford Gas Company, said it was possible for the promoters to lay their trunk main farther north through their own area, and although that might be a little more expensive it was nothing compared with the difficulties which the laying of such a main might put in the way of the Romford Company, charged as it was with the duty of giving a supply of gas in the district. If the Gas Light and Coke Company was allowed freedom to lay a trunk main or mains anywhere they pleased it would seriously handicap the Romford Company in its endeavours to give a supply of gas to its consumers in the most convenient and cheapest manner. If, however, the Company was to be allowed to lay a trunk main through the northern part of the Romford Company's area, then it should be restricted to a particular route where it would cause the least inconvenience.

Mr. *George Evetts*, Consulting Engineer, spoke of the rapid increase in the consumption of gas in the Romford area during the past few years, and said that if the Gas Light and Coke Company were allowed a free choice for the route of a large trunk main across the area, it would seriously interfere with a co-ordinated plan of mains-laying for local distribution purposes. A ring main round the district would shortly be necessary to meet the demands and ensure the supply, and it would be a serious matter if, when the Romford Company came to lay that ring main, it found a 24-in. trunk main belonging to the Gas Light and Coke Company which provided no service to the consumers in Romford and could not be touched in any way.

After a few concluding remarks by Mr. Tyldesley Jones on behalf of the Gas Light and Coke Company, the Committee decided to allow the clause, but with the insertion of words prohibiting the Company from laying trunk mains in the Romford High Street or the road through Hornchurch. The Committee also ordered words to be inserted in the Bill which would make it clear that the Gas Light and Coke Company has no powers to supply gas in Romford.

In this form, the Bill was ordered to be reported for third reading.

Sunderland Basic Price Order

Before the Special Orders Committee of the House of Lords on Tuesday, April 11 (Earl Onslow presiding), the Sunderland Corporation successfully applied for the Sunderland Gas Company's Special Order, recently made by the Board of Trade, to be referred to a Select Committee of the House of Lords for further consideration.

In the "JOURNAL" for Nov. 23, 1932, p. 575, we published an account of the proceedings before the Director of Gas Administration at the Offices of the Board of Trade when the Sunderland Gas Company applied for a Special Order and the fixing of a basic price. The Sunderland Corporation took part in the proceedings and the Board of Trade has since issued an Order. The application of the Sunderland Corporation to have the Order referred to a Select Committee for further consideration was based on the claim that the actual facts were not placed before the Board of Trade, and that since the accounts of the Company for the full year 1932 have been issued a different state of affairs has been shown to exist from that which was the basis put forward at the Board of Trade inquiry.

Mr. GIBSON PRITCHARD (Messrs. Sharpe, Pritchard, & Co., Parliamentary Agents), on behalf of the Sunderland Corporation, stated the grounds for the application. He said that the principal part of the evidence given at the Board of Trade inquiry in November last in favour of the basic price was based on estimates of the working expenses and receipts for the year 1932, because the inquiry was held in November, and therefore it was not possible to take the full accounts for the year as a basis for arriving at a figure at which the basic price should be fixed. It was apparently on the strength of that evidence that the Board of Trade had made the Special Order, but having had an opportunity now of inspecting the Company's accounts for the full year of 1932 a different state of affairs from that estimated at the Board of Trade inquiry was revealed. For instance, the estimated expenditure stated at the inquiry, for the year, was put at £142,078, but in fact the figure was £4843 less than that, and it was arrived at after making an increased allowance for maintenance of mains and also works repairs and maintenance, as compared with the year 1931, the former figure being £5656 increase and the latter £4957 increase on 1931, or nearly £10,000. Thus there was a considerable difference between the actual figures and the estimates upon which, presumably, the Board of Trade had granted the Order. On the basis of the accounts as they actually were at the end of 1932, and with the 6d. per therm basic price and 6% basic dividend provided in the Order, the Company could at once, without making any provision by way of reducing prices to the consumers, pay an increased dividend, and the Corporation contended that in the present position in Sunderland that sort of thing should not be allowed. There were 57% of registered workmen unemployed in Sunderland at the present time, and Mr. Pritchard submitted on behalf of the Corporation that the Company should contribute towards meeting that position by reducing the price of gas before being put in the position of paying higher dividends. It was possible for the Company to reduce the price of gas and still continue to pay the same rate of dividend that it had been paying for the past fifteen years. The Company's Reserve Fund was full, and there were no debentures or debenture stock; and it was for these reasons the Corporation asked that the Order should be sent to a Select Committee so that the actual facts as they now existed could be investigated for the purpose of fixing a new basic price, instead of relying upon the estimates which had been placed before the Board of Trade at a time when the complete accounts for 1932 were not available.

Mr. J. SEAGER BERRY (Messrs. Sherwood & Co., Parliamentary Agents), on behalf of the Company, contended that no new facts had been brought forward to justify the Committee adopting the course which had been suggested. The reduction in the expenditure of £4800 mentioned by Mr. Pritchard was due to the fact that some 25 to 30% of the gas supplied by the Company in 1932 was coke oven gas, and that fact was brought to the notice of the Board of Trade at the time of the inquiry last November (Mr. Berry read an extract from the "JOURNAL" report of the Board of Trade inquiry proceedings in support of this statement). At the same time, there was no reason for supposing that the quantity of coke oven gas available in the future would be greater than it had been in the past. The whole case was argued at considerable length before the Board of Trade, and witnesses were called on both sides, and in the opinion of the Company there was no better tribunal than the Board of Trade, with its expert accountants, to fix a fair basic price.

The CHAIRMAN pointed out that there was a conflict of opinion between Mr. Pritchard and Mr. Berry as to what was actually before the Board of Trade at the time of the inquiry.

Mr. PRITCHARD repeated his allegation that the estimated figures in November for the year 1932 placed before the Board of Trade were higher than were the actual figures as shown by the completed accounts in December, notwithstanding that £10,000 more had been allocated to repairs and renewals of mains and works. At the present time the Company could pay a 6% dividend and, the Corporation contended, afford to reduce the price of gas by 2d. per 1000 c.ft.

The CHAIRMAN, after a private consultation with the Committee, said they would recommend to the House that the Order be referred to a Select Committee for further inquiry.

Efficient Boiler Management, with Special Reference to the Cost per Therm*

By JOHN WEBSTER, Port-Glasgow.

[Extract.]

The following is an attempt to put forward some observations on methods whereby the thermal and economic efficiencies of gas-works steam raising plant (solid fuel fired) may be improved, with beneficial results on the cost per therm of gas made and sold.

GENERAL.

The quantity of steam used on gas-works varies greatly from works to works, and a table of approximate weights of steam used per 1000 c.ft. of gas made, also approximate cost of fuel only, for steam raising, is given below.

Type of Carbonizing Plant.	Pounds of Steam Required for all Purposes per 1000 C.Ft. of Gas Made.	Full Costs* for Steam Raising per Therm of Gas Made.
	Lbs.	Pence.
Horizontal retorts.	60 to 90	0·10
Vertical retorts.	80 ,, 120	0·28
Horizontal retorts and blue or carburetted water gas plant . . .	170 ,, 230	0·45

* Coke breeze debited at 7s. per ton

The divergent conditions, as to lay-out of boiler plant, type of carbonizing plant, and the relative position and type of works plant, preclude the consideration of all sizes of works, and the following notes deal in the main with works whose annual output falls between 400 million and 50 million c.ft.

BASIS OF COMPARISON.

To make the scope and usefulness of the notes as wide as possible, a hypothetical works has been taken:

Carbonizing plant	Vertical retorts
Declared calorific value . . .	450 B.Th.U. per c.ft.
Gas made per annum	200 million c.ft., 900,000 therms
Gas sold per annum	190 million c ft., 855,000 therms
Coal carbonized	11,000 tons

The steam generated is used in: Continuous steaming of vertical retort charges (15% by weight of coal carbonized), driving exhauster engines, driving tar pumps, &c., driving coke extractor gear engines, driving hydraulic tipping ram, pumps, sulphate of ammonia production, and gasholder water heating arrangements when necessary.

The boiler is of the Lancashire type, working at 80% of full load at time of heaviest demand. Working steam pressure, 100 lbs. per sq. in. The boiler shell and setting being in good order, the furnaces fitted with modern, steam jet, forced draught grates, the feed water coming from town's mains. In such a works, with the boiler plant operated without technical control, the results of one year's working would be as shown under Table 1, Col. A.

TABLE I.—*Working Data, &c., of Boiler Plant for One Year.*

—	A.	B.	C.
	Tons.	Tons.	Tons.
Fuel used—			
Coke breeze, 10,000 B.Th.U (under ¾ in.)	990	990	990
Coal slack, 12,000 B.Th.U. (washed)	1495	1025	776·5
Total	2485	2015	1766·5
Fuel cost—	£ s. d.	£ s. d.	£ s. d.
Coke breeze at 7s. per ton . .	346 10 0	346 10 0	346 10 0
Coal slack at 11s. per ton . .	822 5 0	563 15 0	427 1 0
	£1168 15 0	£910 5 0	£773 11 0
Water evaporated (lbs.)	24,200,000	24,200,000	24,200,000
Actual evaporation of water per pound of fuel (lbs)	4·35	5·36	6·12
Equivalent evaporation, from and at 212° F. (lbs.)	5·25	6·44	6·40
Gross cost of fuel for steam raising, per therm of gas made (pence) .	0·311	0·243	0·210
Gross cost of evaporating 1000 galls. (10,000 lbs.) of water	9s. 8d.	7s 6d.	6s. 6d.
Thermal efficiency	45%	57%	68%

* Paper read before the Scottish Junior Gas Association (Western District), Feb. 4, 1933.

It is obvious from the low efficiency shown that heavy heat losses are occurring, but before taking steps to reduce these losses as far as possible, some information as to their nature and extent must be obtained. An approximate distribution of the calorific value of the fuel under the foregoing conditions is given in Table 2, Col. D, the calorific value of the fuel on the air-dried basis being 100%.

TABLE 2.—*Distribution of Calorific Value of Fuel.*

—	D.	E.	F.
	%	%	%
(*a*) Heat units lost due to incomplete combustion	9	4	4
(*b*) Heat units lost by sensible heat in chimney gases	24	20	20
(*c*) Heat units lost in evaporating excess moisture in coal	2	1	1
(*d*) Heat units lost in combustible matter in ash	2	1	1
(*e*) Heat units lost due to radiation and convection from boiler shell and setting	6	5	5
(*f*) Heat units absorbed in raising temperature of feed water to boiling point	12	12	1
(*g*) Heat units in steam delivered at boiler stop valve	45	57	68
Calorific value of fuel (on an air dried basis)	100	100	100

HEAT LOSSES IN STEAM GENERATION.

It will be noted from Table 2 that the main losses occurring come under three heads.

(1) Losses occurring during combustion of the fuel.
(2) Losses due to miscellaneous causes, condition, storage, and handling of the fuel.
(3) Losses due to necessity of raising feed water to boiling point.

Fuel firing on works of the sizes under consideration being carried out almost entirely by hand, the skill of the firemen will have a decided bearing on the efficiency of the plant, and as the most efficient workman is one who has a knowledge of the technical bearing of the operations he carries out and so takes an intelligent interest in his work, no effort should be spared to have the boiler firemen taught the rudiments of combustion and fuel economy. To this end the classes conducted by the Smoke Abatement Society, in various centres throughout the country, should be taken full advantage of, gas undertakings either giving facilities for attendance at the classes, or giving preference to those holding the certificate of that body, when filling vacancies.

Reviewing the losses in order, we find that those occurring under (*a*) heat units lost due to incomplete combustion, in this case 9%, by no means the maximum loss possible under this head. The presence of free O_2 in the waste gases is no proof that it has passed through the fuel, as the points of air leakage into the boiler flues are many and difficult to locate. The only correct method of ensuring correct air supply is to measure the amount of air passing to the grates. This, combined with the combustion control method recommended later, should form a practical means of maintaining a relatively high efficiency of combustion.

(*b*) *Losses of Heat Units in Chimney Gases.*—The greater the temperature difference between the gases leaving the boiler fire and the chimney gases, the more efficient is the heat transmission, provided the temperature of the waste gases has not been reduced by unfiltered air. Optimum draught efficiency being obtained, with natural draught, with chimney gases of 500° F. (equivalent to 12% to 14% of heat units of fuel), only the sensible heat in chimney gases over and above this temperature is surplus. By the introduction of economizers the sensible heat in chimney gases can be returned to the boiler, by means of preheating the feed water, but due to the cost of this apparatus, the necessity for a by-pass flue, provision of induced or balanced draught apparatus, and the attention these require, they are not frequently taken advantage of in this size of works, especially in view of the other sources of feed water heating available on gas works.

The losses occurring under the foregoing heads are closely inter-connected.

Simple Combustion Control.

The simultaneous determination of temperature, draught conditions and CO_2 content of waste gases, being necessary for the proper control of combustion in retort settings, so also must these determinations be made in the control of combustion in boiler settings. To avoid complication, only the apparatus and routine of the smallest unit is here described, the system being applicable to the largest boiler plants, with the introduction of recording apparatus and the service of trained chemists.

The determinations are made by means of three pairs of tubes which are permanently inserted through the setting brickwork, one pair being located in each of the side flues, 2 ft. in front of the individual flue dampers, while the third pair is placed in the main flue, approximately 2 ft. from the nearest individual damper. Should water tube boilers be in use, corresponding positions can be arranged. The first tube in each set, fitted with a stop-cock, is used for the determination of draught conditions, and also for the drawing of samples of flue gas, for CO_2 determination. The other tube, of sufficient diameter to accommodate a temperature indicating instrument, has the free end closed with a ground plug when the tube is not in use.

For routine testing the tubes in the main flue are utilized and the readings obtained apply therefore to the chimney gases, tests being made at convenient intervals during the 24 hours. Should any change in conditions occur, similar tests are carried out on the indivdual flues and the fault so traced.

The following apparatus is inexpensive, robust, and capable of being manipulated with satisfactory results by workmen of average intelligence.

Draught.—The **U** tube water-gauge is the standard instrument for this purpose, but an open scale aneroid type of gauge, having zero adjustment, is read with greater facility and is consequently more often consulted. It requires, however, to be protected from the action of flue gases by means of a seal.

CO_2 Determination.—The CO_2 Thermoscope, made by the Underfeed Stoker Company, is a convenient substitute for the standard Orsat apparatus, and gives results sufficiently accurate for boiler combustion control. Many more uses will no doubt suggest themselves for utilizing this instrument on gas-works.

Temperature.—A thermometer is available specially suitable for use on boiler flue gases, up to 950° F., having a specially long insulated stem, the bulb being protected by means of a perforated cage.

Assuming such a method of combustion control to be inaugurated, the possible savings which would justify its operation may be profitably examined. By reference to Table 3, it will be noted that similar percentage loss of

Table 3.—*Percentage of Calorific Value of the Fuel Lost in Chimney Gases, at Various Temperatures and CO_2 Content.*

CO_2% in Chimney Gases.	% Calorific Value Lost.									
13	13	15	17	18	19	20	22	24	26	27
12	14	16	18	19	21	22	24	26	28	29
11	15	17	19	20	22	24	26	28	30	32
10	16	19	21	22	24	26	28	30	32	35
9	19	21	23	25	27	29	31	33	36	38
8	21	23	25	28	30	33	35	38	40	43
7	24	26	29	32	34	37	40	43	46	49
6	28	31	34	37	40	43	47	50	54	57
5	33	37	40	44	48	52	56	59	63	68
..	500	550	600	650	700	750	800	850	900	950

Temperature of chimney gases.

the calorific value of a fuel occurs when waste gases of 600° F. and 5% CO_2 content pass to the chimney, as when waste gases of 900° F. and 8% CO_2 pass. From this it is obvious that the consideration of the economies possible, due to combustion control, are best studied as a unit.

Reverting to Table 2, column D, it will be seen that the losses occurring due to the combustion of the fuel amount to 33% of the heat of this fuel, this being brought about by an average chimney gas temperature of 680° F. and a CO_2 content of 7%. Under a combustion control system the temperature of the chimney gases are reduced, say, to 600° F., and the CO_2 content increased to 8·5%, when, from Table 3, we find that these conditions represent a heat loss of 24% of the heat of the fuel, showing an economy of 9% over the previous conditions.

(*c*) *Heat Units Lost in Evaporating Excess Moisture in Coal* (2%).—With washed coal gum or slack excess moisture may amount in wet weather to 25% by weight, and as 1% excess moisture represents 0·1% of the calorific value of the fuel, the loss may amount to 2·5%. A certain amount of moisture is necessary to cause initial cohesion and render the coke structure more porous, but boiler fuel should be protected from rain when stored.

(*d*) *Heat units lost in combustible matter in ash and sensible heat of ash* (2%).—With suitable-sized openings in the firebars and careful cleaning of the fires, the loss due to combustible matter in the ash should not exceed 1% of the calorific value of the fuel. The sensible heat in the ash is so small as to be of no practical significance.

(*e*) *Heat units lost due to radiation and convection of heat from boiler shell and setting.*—As in the case of steam mains, the boiler shell is usually provided with heat insulating material, and in this connection it is of importance to note that there is an economic thickness of material, beyond which the savings effected are less than the cost of the material. A smooth white surface helps greatly in reducing radiation losses, and boiler settings are frequently finished in white enamelled bricks; where this has not been done the losses may be high indeed. Where ordinary firebrack is the finished surface, a periodic spraying of the exterior walls with a 50-50 mixture of silica sand and lime will fulfil the double duty of reducing heat losses and the closing of the minute cracks through which air leakage into flues occurs. By insulating the front of the boiler shell, from which the heat losses are 50% greater than from a similar horizontal area, a further saving may be effected; insulation of this part is often thought to be unremunerative, due to difficulty of application of material and possibility of damage, but this is not so. By these methods the loss may be reduced to 5%, a saving of 1%.

The individual savings having been ascertained, these being by no means the maximum possible, the possible heat distribution under the new conditions will be as Table 2, Col. E, and the corresponding working data in Table 1, Col. B.

Having considered the heat units lost under heads 1, 2, which losses influence the equivalent evaporation per lb. of fuel, the factor which determines the relationship between the equivalent and the actual evaporation now claims attention.

In the case under review the average temperature of the feedwater over the total weight of water used is 55° F., the supply being from town's mains

(*f*) *Heat units absorbed in raising temperature of feed water to boiling point* (12%).—Where it is possible to preheat the feed water to the temperature at which it commences to generate steam, under the prevailing pressure, by means other than live steam, not only is the efficiency directly increased, but the circulation of the water inside the boiler, never very good in the Lancashire type, is much improved. Heated feed water is also of advantage where water softening plants are in use.

The sources of surplus heat suitable for feed water preheating on the average gas works are:

(1) Sensible heat in crude gas from retort benches or water gas plants.
(2) Surplus heat in boiler chimney gases.
(3) Surplus heat in exhaust steam from engines.
(4) Sensible heat in exhaust gases from gas engines.
(5) Sensible heat in effluents and waste gases from S/A or similar plants.

The total savings effected in the case under consideration, by the adoption of methods for more efficient boiler management, may be summarized as follows:

	£	s.	d.
Net annual saving in fuel due to more efficient combustion, &c.	258	10	0
Net annual saving in fuel due to utilization of heated overflow from water cooled condensers	36	11	6
Net annual saving in fuel due to utilization of surplus heat from S/A effluent	31	17	6
Net annual saving in fuel due to utilization of surplus heat in exhaust steam	53	5	0
Total net saving per annum in fuel account	£380	4	0

This being equivalent to a reduction of 0·107d. per therm of gas sold.

The working costs, &c., under final conditions are shown in Table 1, Col. C, while the distribution of the calorific value of the fuel is shown in Table 2, Col. F.

Briefly summarized, the results are:

Actual evaporation increased by 1·77 lbs. per lb. of fuel.

Equivalent evaporation increased by 1·15 lbs. per lb. of fuel.

Over-all efficiency increased by 23%.

Cost of fuel for steam raising reduced by 0·101d. per therm of gas made.

Cost of evaporating 10,000 lbs. of water reduced by 3s. 2½d.

Fuel, of course, is not the only factor entering into the cost of steam raising, but, as has been shown, a decrease in the "selling" price of 0·107d. per therm of gas, or 0·48d. per 1000 c.ft., is possible in this case, and the decreased costs possible in other works can be readily obtained by insertion of the corresponding figures.

No credit is given in these figures for decreased handling, firing, and upkeep costs, consequent on a reduction of 709 tons less fuel bought in.

The reaction which the preheating of feed water has on the steam raising propensities of a boiler is similar to that effected by increasing the evaporating surface, and in this case the steaming capacity of the boiler would be increased by the proportion which the fuel saved is of the fuel consumption before preheating is carried out—*i.e.*,

$$\frac{248{\cdot}5 \times 100}{2015} = 12{\cdot}6\,\%$$

Thus where boiler capacity (either solid fuel fired or surplus heat boiler) is taxed, preheating of the feed water, if not already carried out, will delay the necessity for purchase and installation of new boiler plant.

Pipes and Pipelines on Gas-Works and District*

By A. W. Attwood, Coventry.

Cast-iron socket and spigot pipes are used almost exclusively for underground low-pressure gas mains in the works, the principal reason for this being their suitability to withstand the action of corrosion in the ground without the necessity of a protective covering. This is even more essential in some parts of a gas-works, such as may be found round the chemical works, where the ground is liable to be contaminated with acids.

Ordinary open socket and spigot pipes cast vertically to British Standard Specification, Class A or B, are suitable for low-pressure work with socket joints made of lead wool and yarn caulked well home, and blue lead run in last and again caulked. This, I think, is general practice, but there may be a slight difference of opinion as to the best type of joint; the one given above being used with satisfaction at Coventry.

Flanges have to be introduced into the main at points along its course for connection to machinery and for the insertion of valves (socketed valves not finding much favour these days). These flanges for this type of work are made to the Table for Gas Valve Flanges approved by the Institution of Gas Engineers, which is Table A in the British Engineering Standards Association. The flange joints are made with Scotts cement and yarn or sheet asbestos cut and holed to the same template as the flange.

The mains, after laying, are tested under air pressure for leaks at the joints with soap and water. In some cases with extensions to live mains the test is carried out with the gas itself after bagging or capping off as far as the work has proceeded.

It is good practice to build a pit around valves if possible, so that the working parts can be greased at intervals to ensure free working. This particularly applies to valves which are seldom used, as they are likely to be neglected, and trouble with sticking may occur when they are required.

In connection with the laying of large gas mains, particularly on the works, it is often necessary to trench deeply, which sometimes entails walling and strutting. This, of course, is an expensive item and to be avoided wherever possible. As a works grows, however, a track has to be chosen for a new main, which means going below existing mains to cross, and a deep trench is essential. This is where intelligent planning in the Engineering Department, with an eye to future requirements, can avoid this expense to a certain extent, but however well one may visualize the future requirements one's efforts in this direction may be frustrated by progress. Later types of plant differing largely from that anticipated may call for awkward and deep connections.

The necessity for boarding a trench may also depend on the type of ground the main is passing through. In virgin ground of solid clay or gravel it would naturally be safer to go to a greater depth without boarding than in the case of made up ground or sandy soil.

The cost of boarding a trench would vary considerably according to the conditions stated above, but an approximate figure for a trench for a 36 in. main through poor ground laid to an average depth of 8 to 9 ft. would add 40s. to 45s. per yard run to the cost of the work.

With regard to supporting of large mains through made up ground, this is very necessary where there is likely to be heavy traffic such as railway sidings or lorries above. A definite figure cannot be given for the depth down to solid ground below the invert of the pipe, at which it is a cheaper proposition to cast concrete piers at the back of the sockets in preference to rafting, as this would naturally depend on the size of the main. This may be approximately given as 5 to 8 ft. When the depth exceeds this a concrete raft reinforced with fabricated steel such as B.R.C. Fabric or "Expamet" is a better proposition. A small pier in blue or hard brick can then be built off this to support the main at the back of each socket. The raft can often conveniently be made wide enough to accommodate several smaller mains as well.

For mains in roadways off the works, it is often necessary to cross bridges over canals and railways. The method favoured at Coventry is a special bridge pipe constructed of flat steel plate top and bottom riveted to M.S. channels forming the sides, the whole being bent to the arch of the bridge and connected to the main at each end with special flange and socket rectangular to round cast-iron pieces. A pit is built at each end and filled with sand, so that a quick examination can be made should any movement in the bridge structure or the roadway adjoining be likely to draw the joints. With this method it is not necessary to interfere with the bridge structure in any way.

Before leaving the question of cast-iron pipes one can hardly overlook the claims of "spun" pipes, which have gained a certain amount of favour in the past few years. These are lighter and cheaper, and are also cheaper to lay on account of their greater lengths requiring fewer joints, but our observations up to the present have been that they vary in the outside diameter, and in some cases leave little or no room to make the joints in the socket. We have also had trouble with the "pull through" for cleaning the mains sticking inside the pipes owing to the inside diameter varying.

From tests we have had made, the metal in the spun pipes has greater tensile strength, but appears to be more brittle.

Steel Pipes for High-Pressure Gas Mains.

I should now like to give you a few notes and observations on the laying of the 15 in. bore high-pressure steel main forming part of the ring main and the branch to our Kenilworth Works. The type of pipe used is the lap-welded steel pipe with long sleeve joints for welding (15 in. weldless tube was not available when we were ordering).

The steel and the tubes were of British manufacture throughout, the former being tested to comply with an ultimate tensile stress of 24 to 28 tons per sq. in., and the tubes themselves were finally hydraulically tested to withstand a pressure of 500 lbs. per sq. in.

The tubes were 15¼ in. outside diameter by ¼ in. thick metal, and were supplied in lengths of approximately 25 ft. 6 in. The weight of each tube was checked and found to vary very little from the estimated weight, and within the tolerances given. The depth of the sockets for the 15 in. size was 8 in.

The tubes were then coated externally with a covering of bitumen asphalt by machine. It was most important that this process should be carefully carried out, because if proper adhesion between the metal surface of the tube and the asphalt had not taken place, and there was the slightest break in the asphalt covering, corrosion would take place beneath the covering, and the whole object of the protective wrapping would be destroyed.

Close inspection at the manufacturers' works and by our

* From a paper before the Midland Junior Gas Association, Birmingham, March 9, 1933.

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own staff for defects in this respect was maintained, but we had very little to complain of. The covering was approximately ⅜ in. thick, and we found that there had been very little damage done to the covering in transferring the tubes from the works to the site. They were conveyed by special railway wagons, and carted from the station on low timber wagons and unloaded alongside the trench.

With regard to section valves in the main, flanged sockets and flanged spigots, each with an effective length of 2 ft., were provided for inserting the valves at the points decided on. These were made complete at manufacturers' works, and the flanges machined true and square across the face after being welded on the tube, as this process more often than not distorts the flange, and it would have been practically impossible to make a tight joint of the type we were using if these had not been trued up.

The flanged joint itself was made of "Klingerit" discs (a hard compressed asbestos sheet), ⅛ in. thick. These were obtained cut to size with the necessary holes for bolts in them. They were smeared slightly with red lead, and the two flanges bolted together, taking care to put an even tension on all the bolts. Providing the flanges were true as previously described, we were able to make this joint quite tight at the air test pressure of 100 lbs. per sq. in.

The smaller sizes of main branching off the 15 in. diameter main were laid and jointed in a similar manner, the only difference being in the manufacture and wrapping of the tubes. They were of the weldless type, and coated with a bitumen solution, double wrapped with hessian cloth.

The whole of the tubes before being despatched from the manufacturers' works were coated inside with a good quality mineral oil of approved type.

The actual laying of the high-pressure main was done by our own staff with the aid of an experienced welder hired from the tube manufacturers. Three or four lengths of tube were welded together above ground, and then lowered into the trench, pushed home into the preceding length, and welded. The excavations had to be a little wider and deeper at these points to permit of the welder working.

Along the main at the points necessary welded steel syphon pots were inserted. These have flanged covers on the top—the joint being made with "Klingerit"—and are fitted with a special lubricated syphon cock for emptying under pressure.

The testing of the main was carried out periodically as the work proceeded, a plate being welded on to the last pipe laid, and the whole of the section back to the last valve being subjected to the 100 lbs. per sq. in. test pressure by means of a portable petrol driven air compressor. After being satisfied that all the welded joints were sound, the sockets, which, of course, were not previously covered with bitumen, were so treated. A specially made mould was placed round the socket and the welded joint, extending each way on to the wrapping of the tubes, and hot bitumen was poured in, making a homogeneous covering to the steel main throughout its length.

Steam Mains.

As cast-iron pipes are unsuitable for the purposes of live steam mains, owing chiefly to their not being able to withstand the expansion stresses, and the possibility of flaws in the castings, steel is invariably used. Cast-iron flanged pipes are, however, used for exhaust steam mains. Here again provision must be made for expansion. The method we have adopted at Coventry is the placing of a copper corrugated expansion pipe in the main at the places required.

Flanged piping is usually adopted for steam mains. There are again many types of flanges, perhaps the two most popular being the welded type and the screwed and expanded-on flange. The latter type is used to a large extent at Coventry. Stamped steel flanges are screwed on to the tube, and the latter is expanded into them. This flange is suitable for steam at working pressures met with on most gas-works.

Local circumstances, of course, govern the layout of the steam main, but it is good practice to arrange the main or mains so that portions can be laid off for repairs, &c. In this connection, the "ring" main is ideal, although it is more expensive. It has, however, the great advantage of offering an alternative path for the steam if it should be necessary to have a portion off for attention. If there is no alternative route it means a shut-down job.

The run of the main should be as direct as possible from the boiler to the plant, thus avoiding to a certain extent condensation troubles and loss in pressure; the number of joints is also cut down to a minimum, and, together with this, there is a saving in cost.

Provision should be made in the size of the main, and with branches blanked off, for possible extension in the future.

Suitable means should be provided for expansion and drainage. With regard to the former the usual method is the insertion of expansion bends. Sliding expansion joints are used where lack of space prevents the use of a bend, but there are several disadvantages in using these joints—the principal one being the fact that they must be under constant supervision to see that they are functioning properly. In long runs of steam main when it turns a right angle, such as round the end of a long building, it is often unnecessary to put in expansion bends, as the pipes will be flexible enough to give the required movement.

The type of flange joint for steam main work favoured at Coventry is a brass corrugated ring, in which asbestos cord, heavily graphited, is laid in the corrugations. This joint gives very satisfactory results.

Discussion.

The President (Mr. F. A. C. Pykett, Coventry) said there was nothing to compete with steel mains and welded joints for high-pressure gas. There was much to be said for the butt-welded joint, which was stronger than the long sleeve joint. Regarding low-pressure distribution, the cast-iron pipe held the field. The turned and bored joint, properly made, resulted in a thoroughly good job, and some gas undertakings used it throughout. That was the case when he was at Lancaster, and Liverpool favoured it to a large extent. On the boosting mains in London the system was also applied in liberal measure.

Mr. J. H. Duignan (Kidderminster), in moving a vote of thanks to Mr. Attwood, said that on the works at which he was engaged they tested the low-pressure mains for 12 hours at 15 lbs. pressure. Regarding bridge pipes he did not see the necessity for the inspection pits. In reference to spun pipes they had found the results quite satisfactory; they had used them up to 15 ft. long. As to tests on the high-pressure main, he used a steam recording gauge with a 24-hour chart. The steel mains were satisfactory, in his opinion, provided they were not cut. If there was no subsidence turned and bored joints answered quite well.

Mr. A. Whitehouse (Birmingham), in seconding, expressed the view that the British Standards Table B met all requirements for low-pressure work provided the pipes were properly consolidated. In bridge work, if the pipes were laid under the footpath there should not be a great deal of vibration. It seemed to him that the lead yarn and rubber ring joints were destined to take the place to a large extent of the ordinary cup joint. Weldless steel pipes were available up to 16 in. diameter; but anything above that should be of the lap welded type.

The resolution was carried, and Mr. Attwood, in reply, explained that in the laying of pipes on bridges they were placed on creosote and sand, and not on the concrete. The pits were only for safety, in the event of vibration shaking the joints. The test pressure on steel pipes was 100 lbs. and extended over 24 hours. He had had very little experience with turned and bored joints, and for gas work they did not appear to him to offer any great advantages. A thicker pipe for high-pressure gas should be used where the road had to carry very heavy weights. In bridge work he always endeavoured to place the pipes under the pathways. In regard to condensation, the bucket type of trap had proved satisfactory; and although he had not tried it, a piston operated trap had a good reputation.

In the subsequent discussion, the Chairman said he did not believe in putting a test upon a main for a considerable period. The soap and water test was usually effective. Regarding the rubber ring joint, trouble was sometimes experienced owing to the shrinking of the rubber. To get proper results it was essential to have a caulking tool that exactly fitted the socket.

Mr. Duignan said that yarn and run lead were effective, if the wool was driven up sufficiently.

Mr. C. H. Woodfine (Wellington) spoke of the value of coating pipes internally and externally; some coated pipes, laid 35 years ago, which were recently taken up, were in good condition. His experience favoured the socket welded pipes; with the butt welded there had been fractures. He had found the application of bitumen and hessian cloth satisfactory.

Mr. S. Brockband (Walsall) suggested that it would be an advantage if mains were laid overhead on the works to a greater extent than was usually done. At Walsall they had carried the pipes on tressles on the outside of bridges.

Mr. J. H. Wainwright (Halesowen) said the economic advantage of cast iron lay in the fact that it was cheaper than steel. Regarding the use of the rubber ring, the claim by manufacturers was that in effect it was a lead joint, because the rubber was lead tipped, and that it was the metal, and not the rubber, that came into contact.

Mr. A. Kenrick (Nechells, Birmingham) contended that there was objection to the turned and bored joint in that it had no flexibility. As to steel tubes he was always dubious about the wrapping of bitumen and hessian.

Mr. R. L. Greaves (Wolverhampton) advocated, on the works, overhead mains wherever practicable; and Mr. J. C. Cotterill (Worcester) urged the need of care to prevent corrosion in respect of steel mains which were left in the open for a prolonged period. For town use there was much to be said in favour of cast-iron mains, because they were of sufficient thickness to give good holding threads.

A brief reply by Mr. Attwood wound up an interesting discussion.

Suggestions for Increasing Gas Consumption*

By R. T. Mills, Cardiff

Selling gas is a different proposition from that of any other form of merchandise. It might be easy, by adopting some " high pressure " methods of selling gas, to flood the district with sundry appliances, paying no attention to their efficiency or the gas consumption involved. This haphazard method would probably, after a short time, result in the return of most of the appliances to the stores, with subsequent loss to the gas undertaking concerned.

In these days of general depression, and the exercise of economy on all sides, numbers of larger houses have been converted into flats, which are often self-contained, and fitted with separate conveniences. Here is an excellent opportunity of increasing our consumption, and no stone should be left unturned, in order to give an adequate supply of gas to the tenants occupying the flats. It is an easy matter to branch the service for these supplies, and provide a cooker, and possibly lights, to each floor.

The secondary meter can be fitted on a bracket above the front door, or preferably in the cellar, if there happens to be one. In this way, the expense of an additional service is avoided, and, once the supply is in, other appliances can be advocated.

To satisfy, and thereby retain, our consumers, some consideration must be given to the appliances they use. The great tendency to-day is towards labour-saving devices with easy manipulation. To this end, and in order to replace as many black cookers as possible on the district, the Company I represent has devised a scheme which enables prepayment consumers to obtain an all-enamel cooker complete with rack and back, at a very low cost per quarter. Large numbers are taking advantage of the offer, and the days of the black cooker are numbered.

It has not been fully realized how convenient it is to have a gas point ready at hand in the living room or kitchen. Every endeavour should be made to induce the builder to install such a point. Failing this, it is not a difficult job to do after the house has become tenanted.

We claim to be able to meet the demands of all classes of consumer, and while it is desirable, and profitable, to obtain the big consumers, provision must be made to supply the small cottage dweller who has not the same domestic conveniences. In many of these small dwellings there is no bathroom, and, further, the tenants cannot afford an expensive hot water installation. To meet cases such as these, there is a boiler on the market suitable for washing clothes, and also for supplying hot water to a portable bath, which can be housed in the same room as the boiler. The particular appliance referred to operates on the water displacement principle, the bath being fed from an outlet in the boiler, and water is replaced by the ordinary cold water tap positioned over the boiler. During the washing of clothes, the outlet of the boiler is plugged off. These appliances are of the ordinary galvanized type and cost very little extra for this added convenience.

Lighting Difficulties and Solutions.

The gas lighting load must not be given up in despair; efforts by leading men in the Industry are being made to retain this business. Some of our difficulties in the past may be summarized as follows:

(1) Most fittings being fixed on the chimney breast, the greater portion of the light is absorbed by the wall paper.
(2) Inverted burners were often fitted to an adapter, and fixed to the existing wall bracket, instead of a pendant in the centre being recommended.
(3) Inattention to lighting fittings, causing faulty regulation and dissatisfaction to the consumer.
(4) Objection to gas lighting owing to ceilings becoming blackened.

We claim to have made material advance. Most of the fittings to-day are of artistic design and pleasing to the eye. The superheater burner can be relied upon to give the maximum candle-power without glare. Such advantages as the fact that gas is kind to the eyes, and also gives warmth in the winter time, should be stressed. The cause of ceilings becoming dirty should be properly understood. Most people are inclined to blame the gas, but this is not so. In actual fact convection currents rising from the burner carry with them particles of dust. These particles are charred by the heat before being deposited on the ceiling. Gas considerably aids ventilation, for circulation of air is constantly taking place, which contributes towards a healthy atmosphere. To lessen the trouble from dirty ceilings, some new shields are now available, and these are a decided improvement.

A special campaign is in progress in Cardiff, and the results have so far justified the effort. Consumers' attention has been specially drawn to the switch control, which, if properly fitted, can be confidently recommended. Special terms are offered for cash and quarterly payments, and already many of our consumers have taken advantage of the scheme.

A special window display has attracted the public.

Central Heating.

Most of us are familiar with central heating installations employing gas heated boilers. We have in Cardiff several systems in use at the present time, and there appears room for considerable expansion in the direction of smaller installations in places such as shops, offices, workrooms, and small factories. The successful heating of these premises can be undertaken by an ordinary circulating boiler consuming 50 to 60 c.ft. per hour, and a few radiators fixed in suitable positions make an ideal arrangement at a cost little in excess of separate gas heated units. There is the advantage also of this type of installation carrying low maintenance cost. In practice, it has been found that a boiler with an average consumption of 50 c.ft. per hour will heat four 8-loop, 22-in. radiators, and 80 ft. of circulating pipes—this being sufficient to keep 4800 c.ft. of interior space at an average temperature of 60° F.

This system of heating is particularly recommended for its flexibility, for by fitting a valve to each radiator the temperature can be governed to a degree.

Panel Heaters and Small Water Heaters.

This form of heating is becoming very popular, as the units can be conveniently fixed for use in doctors' consulting rooms, in halls and landings of dwelling houses, in small shops, and even in garages. In bungalows it is found that some of the smaller rooms have no fireplaces, or in numbers of cases the builders have fixed a gas fire with the flue discharging into the cavity wall. In the latter case the fire in use is unsatisfactory, and the only way to overcome the difficulty is to provide an asbestos flue. As this is rather an expensive matter, it would appear that a panel heater would provide the solution. These appliances are made in two sizes and look well when fitted neatly to the wall of the room. They can be obtained in any finish to harmonize with the decorations of the room.

From my experience, consumers who have had these panel heaters installed, have been well satisfied with the results. It may be mentioned that these heaters can be connected to a $\frac{3}{8}$-in. connection, and the gas consumption is only 10 c.ft. per hour.

There is a growing demand for small water heaters, and many efficient appliances are available for obtaining small quantities of hot water. The sink or small scullery water heater can be fitted in a convenient position over the scullery wash-up. No flue connection is necessary on this type of water heater, as it is generally fixed in a well-ventilated position, and the gas consumption is low. There is no necessity to increase the size of the gas pipes, or the meter, and this appliance can be fixed without a cold water feed tank. The gas connection is $\frac{3}{8}$ in. and the water $\frac{1}{2}$ in., fitted with a $\frac{1}{2}$ in. stop tap as the control. A much neater job can be made if copper tube is used for the outlet pipe. The temperature of the water is controlled by a thermostat.

Another hot water appliance is specially suited for hairdressing saloons. This heater has a special mixing tap and shower attached, and this makes it ideal for use during rush periods such as are experienced in hairdressing establishments. It is fixed over the basin in the saloon, and water at varying temperatures can be obtained at a moment's notice. This heater is thermostatically controlled, and is obtainable in special finishes. It can be connected to the existing supply pipes. It is understood that certain corporations still insist on a tank being fitted to supply this type of heater, and this unfortunately increases the cost of fixing, and the order becomes more difficult to obtain. A clearer field for our business would result if some of the old bye-laws and restrictions concerning water installations were removed.

Greenhouse Heating.

Here is another avenue for gas consumption. Several greenhouse heaters have been installed in the Cardiff dis-

* From a paper before the Wales and Monmouthshire Junior Gas Association, meeting in Swansea, March 25, 1933.

trict, and in each case have given satisfaction to the consumer. To cite one particular instance, a consumer having a large greenhouse had a partition made with a door leading from one compartment to another. The heater was fixed in the smaller portion. The plants, on reaching a certain stage, and according to weather conditions, are brought into the larger house for hardening purposes during the daytime. If it is found necessary to increase the temperature slightly, the dividing door is opened, and this has the desired effect. The gas consumption is about 3 c.ft. per hour.

A discussion followed. Among the points raised were the attitude of the various undertakings when dealing with the " shifting " population which occupied part of a house, or a flat, for a short time; the maintenance of water heaters; sticking of valves on switches attached to lighting systems; discoloration of panel heaters; the headroom required for certain water heaters and the restrictive bye-laws of some local authorities; thermostats on small water heaters; and the method of meeting consumers' requirements for an enamelled cooker.

Mr. R. T. Mills, replying, stated that temporary occupiers of premises who required a prepayment meter were not generally charged for separating the service, the Company taking a certain amount of risk that the premises would be more or less continuously occupied, though perhaps by different tenants. Water heaters ought to be maintained by the Company and inspected every three to six months. Experiments at Cardiff with different burners had so far not completely obviated the discoloration of panel heaters. On change of tenancy cookers were cleaned and renovated on the premises, which was found to be the cheaper method and quite satisfactory.

Steel Mains for Bridges*

By H. V. Williams, Cardiff

I have prepared a few notes dealing with steel mains which the Cardiff Gas Light and Coke Company have recently laid over bridges in the Cardiff area.

For the purpose in question, steel tubes undoubtedly possess many advantages. They can be obtained in great lengths, and with welded joints gas tightness can be guaranteed. Further, they are light and can be easily handled, while the possibility of fracture owing to vibration or other causes is eliminated.

The first bridge which I will mention carries the Cardiff to Swansea Roadway over the Great Western Railway main line near Ely Station. This bridge had become a source of danger both to vehicular and pedestrian traffic, owing to its extreme narrowness, and in 1929 it was decided to widen it.

The width between the parapets was only 23 ft., and it was decided to construct a footpath 7 ft. 9 in. in width. To carry out this work, a new longitudinal parapet girder 54 ft. 8 in. in length was erected to span the Railway with ten cross bearers built into the brick arch of the existing bridge. The bearers, which had to be stepped to conform to the shape of the bridge, were covered with ¾-in. plate coated with a layer of bitumen 1 in. thick.

Previous to this bridge widening scheme, the gas supply to the rapidly developing area of Ely was dealt with by means of an old 6-in. cast-iron main, and two fairly modern flattened 6-in. mild-steel tubes. These pipes were becoming inadequate to ensure a full volume of gas at peak loads, and it was decided to carry an 18-in. cast-iron gas main into the bottom of Ely Village while the widening was in progress.

The available cover in the proposed footpath was only 19 in., while the roadway was considerably less. Lack of cover precluded cast-iron pipes being employed even had we desired to use them; the space was also insufficient for an 18-in. diameter steel tube. It was therefore decided to take the 18-in. cast-iron main up the approaches, and an oval steel tube 24 in. by 12 in. in section over the bridge.

The cover on the 18-in. gas main was approximately 2 ft. 6 in., and in order to make up the difference in level between this and the steel tube, two rising pieces were necessary, these being shaped from 18 in. diameter to 24 in. by 12 in. oval, each in two sections.

The steel tubes were obtained from the British Mannesmann Tube Company, Ltd., Newport, the total length necessary being made up as follows:

One 46-ft. length . .	24 in. by 12 in. oval
One 36-ft. ,, . .	24 in. by 12 in. oval
Two rising pieces . .	24 in. by 12 in. oval, 8 ft. effective length
Two special ,, . .	24 in. by 12 in. oval to 18 in. diameter, 10 ft. long
	Say, 118 ft. in all.

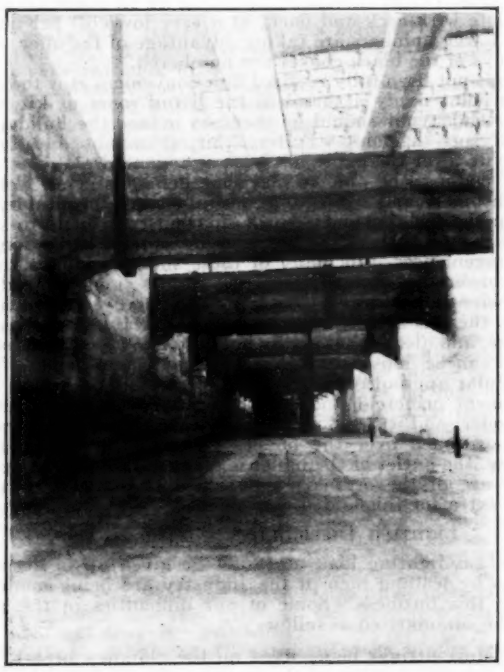
The tube was ⅜-in. thick with long sleeve-type joints arranged for welding.

After comparison of various types of welding, the electric arc method received the Engineer's approval.

Working space being limited, jointing of the various lengths was effected by means of collars, one of which was welded to each separate length of the tube at the makers' works. The hump in the centre of the bridge necessitated the use of a specially " gimped " collar to connect the two main tubes at the junction here.

* Paper before the Wales and Monmouthshire Junior Gas Association, meeting in Swansea, March 25, 1933.

The two long tubes were placed in position on the new footpath, being supported on timber baulks and sufficient space being left under the pipe for the one weld which was necessary in the centre.



Canton Bridge Main half-way through Bridge.

After this weld had been made, the pipe was jacked down very carefully to avoid straining the central joint. With this length in position, the rising and shaped pieces to connect to the approach mains were fixed, and the welders allowed to carry on with the job.

The jointing of the specially shaped 24 in. by 12 in. to 18 in. diameter pieces proved to be the hardest for the welders, as the space was very confined, forcing them to work lying on their backs in order to make the underside of the joints.

After welding, the one end of the completed tube was capped up and the other connected to an air compressor. A pressure of 15 lbs. to the sq. in. was exerted for three hours and the tube found to be sound.

To prevent corrosion the tube had already been coated with bitumen and wrapped with hessian cloth by the manufacturers, and on completion of the job each joint was painted and wrapped with canvas and then painted again, prior to filling in. A good soil specially brought to the site was used in filling in around the side and top of the tube, as a further preventive against corrosion. The footpath

was completed in tarmac and the cover left on the top of the pipe was 6 in. thick.

During the present year further re-construction to the bridge under the Orbital Road Scheme has enabled us to examine the pipe, which was found to be in excellent condition.

Cardiff Bridge, Cowbridge Road.

Somewhat different conditions were encountered here, because of the type of bridge to be constructed. The existing bridge over the River Taff was a masonry structure built in 1859, with cantilevered footpaths which had been added in 1877. The original gas supply to the then " village of Canton " was taken through a 9-in. main laid over the bridge in 1854. When the cantilevered footpaths were added this was replaced by a rectangular cast-iron main 21 in. by 6 in. in section. The approach mains were enlarged to 15 in. diameter in 1898.

The bridge was 45 ft. wide from parapet to parapet, and carried two sets of tramrails, consequently there was no space for vehicular traffic to pass when a tramcar was proceeding in the same direction, and the necessity for widening had been apparent for some years.

In 1930, the Cardiff Corporation decided to re-construct the bridge to give a width of 70 ft., parapet to parapet, at the same time reducing the somewhat sharp gradient of the approaches. This necessitated widening the existing foundations, after which the old bridge was demolished and replaced with a reinforced concrete structure built in two sections.

The 21 in. by 6 in. cast-iron rectangular main was laid in the cantilevered footpath on the southerly side of the bridge, and as a practically continuous supply of gas through the main was essential it was decided to lay a new 18-in. main, dead, on the northerly side and approaches of the bridge, to be connected up to the existing mains at the corner of Westgate Street and Cathedral Road, respectively, as opportunity arose.

The method arranged for constructing the bridge prevented our putting in the new tubes as bridge work was in progress, and these had to be laid after the roadway and one of the footpaths were completed. Provision had, however, been made by means of bays with supporting cross concrete bearers to carry the various services—*i.e.*, gas and water, also electric and post office ducts—the space allotted to us being 3 ft. 4 in. by 2 ft. 5 in.

The space available being limited, we decided to take an 18-in. steel main with long sleeve welded joints across the bridge, and also for a short distance in the westerly approach where considerable filling had been carried out.

It would have been difficult to weld the joints *in situ*, so it was decided to carry out the work of welding on the westerly side and then thread the tubes through the bay for the full length of the bridge.

To avoid excessive strain on the joints, also to prevent damage to the wrapping on the tubes, 1¼-in. diameter rollers, to take the bottom and also the sides of the tubes, were used. These rollers were attached to each alternate cross bearer, the distance between each being 18 ft.

The total length of the tube to be threaded was 240 ft. in ten lengths. We had no difficulty in propelling five of these lengths forward by hand after the welds had been made, while to assist in getting the remaining five lengths into position, we used a winch and manilla rope attached to the front tube.

In this case the tubes were oxy-acetylene welded.

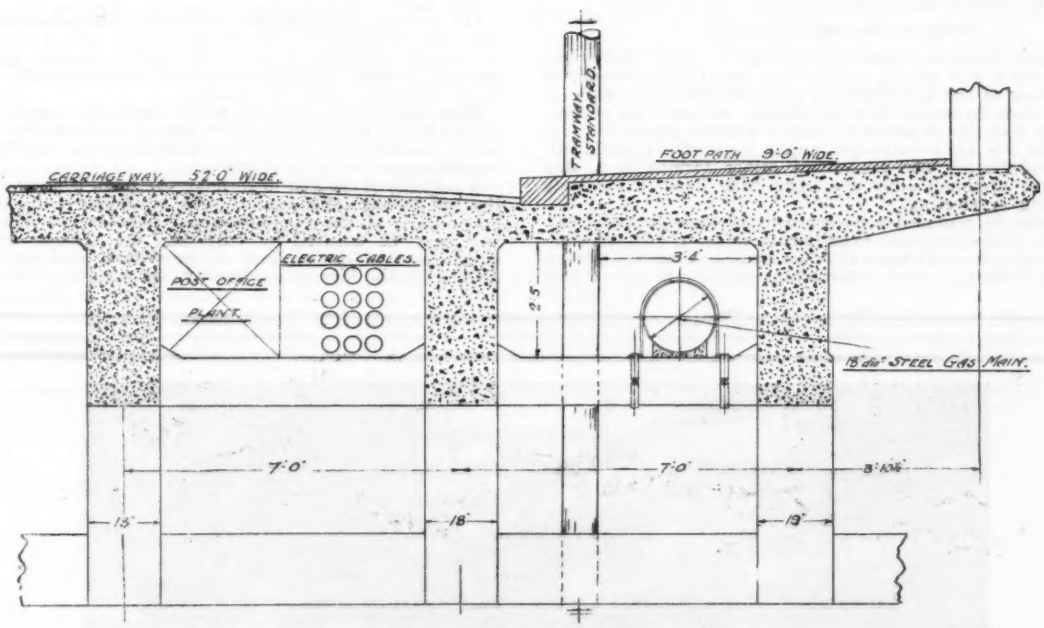
A good line was preserved across the bridge, the upright rollers acting as guide.

Connections to the approach mains were made of steel collars with joints for lead. The lead joints were made solid—*i.e.*, lead yarn at back and run lead in front, set up in the usual way. The bridge and also approach mains were tested under 15 lbs. per sq. in. pressure for three hours, and proved gas-tight.

The wrapping which had been applied by the manufacturers had become slightly bruised in the process of handling, and as a precaution against corrosion the tube was thoroughly tarred and re-wrapped throughout.

After completion the rollers were removed and the pipe was wedged up on concrete slabs, and clips were carried from the cross bearers and over the main to prevent any liability of the tubes becoming strained if excessive floods should cause the river to rise to the height of the pipe.

The pipe has been in action for two years and up to the present has given no trouble.



CARDIFF BRIDGE—POSITION OF GAS MAINS AND POST OFFICE AND ELECTRIC CABLES. PART SECTION THROUGH BRIDGE.

Discussion.

The President (Mr. C. S. Thane, of Newport) thanked the author for giving the paper at short notice, and asked why the joints at the Ely Bridge were electrically welded in preference to oxy-acetylene.

Mr. E. E. Moore (Swansea) asked if any trouble had been experienced with the valves when under test at 15 lbs. pressure per sq. in., whether there was any oxidation during welding, and if any deposits had been found in the syphons.

Mr. J. H. Canning, Jnr. (Newport), asked why the bends shown on the Ely Bridge main were taken so sharply in view of the modern practice of " streamlining " to interfere as little as possible with the flow of gas.

Mr. F. W. Pemberton (Newport), Mr. S. E. Brett (Rhondda), and Mr. C. H. Collins (Swansea) questioned the wisdom of using lead wool in conjunction with molten lead in the solid lead joints, owing to the possibility of burning and consequent brittleness.

Mr. Williams, replying to the discussion, first expressed his gratitude to the Engineer and Manager of Cardiff Undertaking, Mr. H. D. Madden, for permission to use the plans and photographs, and for other facilities and assistance in compiling the paper. Electric welding, he said, was used in preference to oxy-acetylene because of the confined space available for carrying out the work. With regard to the valves at Ely Bridge, these were not on the steel main. They were some 50 yards away in the cast-iron portion, and did not receive this high pressure. With electric welding a flux was used, and no deposits of rust had been found in the syphons. The sharp bends were necessitated by the corner on the bridge being only 6 in. and the approach main cover 2 ft. 6 in., and the steep gradient forced the use of sharp bends to come into ground.

REGISTER OF PATENTS

Gas Drying.—No. 385,908.

NAPIER, J. W., and NEWTON, CHAMBERS, & CO., LTD., both of Sheffield.

No. 23,909; Aug. 26, 1932.

The object of this invention is to provide an improved apparatus for the drying of fuel gases by bringing the gases into contact with hygroscopic absorbing liquids. The apparatus comprises a gas washer and combined stock tank and cooler, the washer consisting of a series of vertical washing chambers having louvred walls to permit the passage through the chambers of the gases to be dried. The lower portion of each wall consists of a plate forming one side of a reservoir at the bottom of each chamber into which the liquid passes after its passage through the chamber. It contains a cooling coil through which cooling medium is passed. The reservoirs are separated by intercalary troughs into which the liquid passes from the reservoirs on each side thereof, and from which the liquid is pumped to the top of a following washing chamber. The stock tank includes an evaporator to which is passed a portion of the liquid pumped to the top of the last working chamber, the tank containing a cooling coil through which is passed the cooling medium which passes through the reservoirs in the washer.

Pilot Jets.—No. 386,379.

HORSTMANN, J. H. G., HORSTMANN, F. O., and the HORSTMANN GEAR COMPANY, LTD., all of Bath.

No. 28,509; Oct. 14, 1931.

The object of this invention is to provide a simple and strong pilot jet which will not be so liable to choking, corrosion, or carburization of the gas orifice as with ordinary jets, while at the same time to enable it to be cleared without fear of fracturing the material of which the orifice forms a part.

The pilot jets are constructed with a body of chromium-surfaced metal having the gas-issuing orifice formed in a thin platinum or platinum alloy disc immovably fixed in the body by spinning or riveting.

There may be provided a burner body of common metal surfaced with chromium, and experiments so far conducted indicate, for example, that brass pilot jet bodies, chromium plated, are able to withstand for a considerable period a degree of heat which would quickly destroy an unplated but otherwise similar pilot jet body. In the above-mentioned metal body the patentees insert the disc, which is of platinum or platinum alloy which is not liable to detrimental corrosion or carburization under the combined action of heat and combustible gases.

The disc is arranged to be a push or press fit in the body of the pilot and afterwards spun or riveted into position to render it gastight in the body. Such an orifice may be readily cleaned by inserting a pin without fear of cracking or injuring the body of which it forms a part.

Distilling Apparatus.—No. 387,459.

SOUTH METROPOLITAN GAS COMPANY, STANIER, H., DAVIS, J. E., and RUMFORD, F., all of Old Kent Road, S.E. 15.

No. 33,321; Dec. 1, 1931.

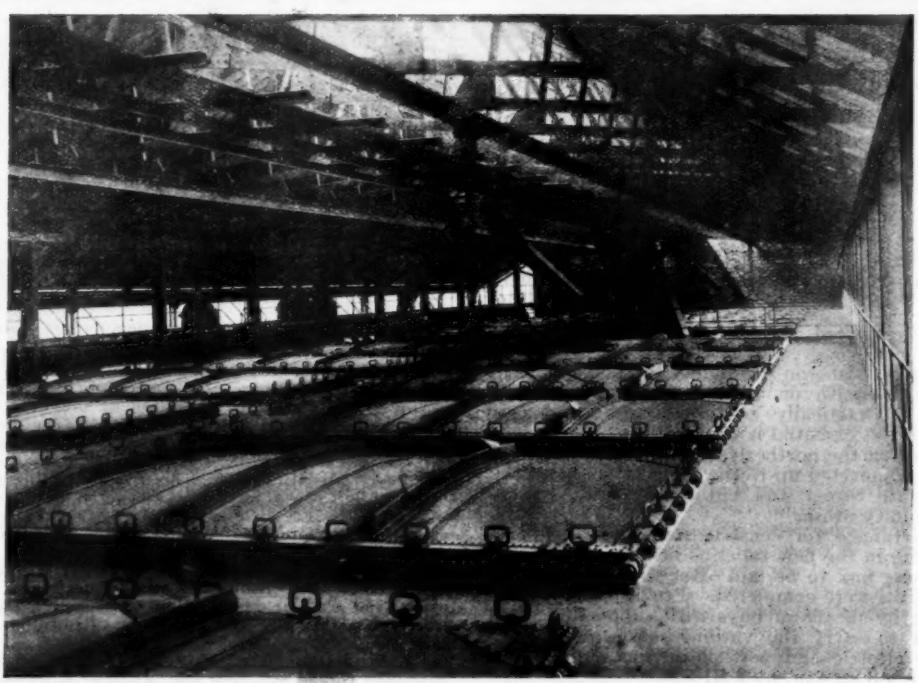
A known form of still for distilling or concentrating liquids, particularly applicable for liquids which owing to their nature should not be overheated or exposed to a temperature of distillation or concentration for a longer time than is absolutely necessary, consists of a pipe, heated to the required temperature, through which the liquid is passed and if necessary circulated.

An investigation of this type of still has shown that it suffers from the defect that a comparatively stationary layer of liquid forms on the heating surface, reducing the rate of transfer of heat from the external source to the liquid in the pipe, so that an undesirably high temperature is necessary; also this comparatively stationary layer suffers prolonged exposure to the heat.

The method of distillation or concentration according to this invention consists in causing the liquid and a suitable gas or vapour to travel together through a heated pipe in the form of a foam. In this manner the production of a comparatively stationary layer is avoided.

When the liquid is not one which distils as a whole, the foam issuing from the exit end of the pipe is received in a separator which removes and retains the liquid from the vapour, and the vapour passes on to be condensed.

A convenient method of forming the foam consists in passing the gas through the pipe at such a velocity as to cause turbulent flow at the temperature of distillation. This type of flow may be ensured by adjusting the velocity of the gas stream so that the product of the velocity and pipe diameter divided by the kinematic viscosity has a value, when all quan-



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tities are expressed in mutually consistent units, of at least 1000, and preferably greater than 3000.

The liquid to be treated is introduced into the gas stream at its point of entry into the pipe (which is preferably at the higher end of the pipe) and is carried through the pipe by the gas. It is found that when heat is applied to the exterior of the pipe sufficient to vaporize a portion of the liquid, the gas and the vaporizing liquid form a foam which moves rapidly and substantially uniformly along the pipe and prevents the formation of a surface film. The foam of gas, vapours, and residue passes into the separating vessel in which the gas velocity is reduced, or used, as in a cyclone separator, to aid the separation of the non-volatile residue. The gas may be re-circulated to assist the distillation of a further quantity of liquid.

The pipe may be heated by any suitable means, but if that includes a circulation over the pipe of a fluid which loses sensible heat and so falls in temperature, then it is preferable that the hottest fluid should enter first into contact with the coil at the end into which the gas and liquid are introduced.

The invention is of particular importance in the distillation of the tar derived from the low-temperature carbonization of coal. Such tar is readily decomposed by heat in the sense that constituents which are capable of being distilled at moderate temperatures become transformed by overheating or prolonged heating into pitch-like products remaining in the still.

Legal Intelligence.

East Kent Gas Company, Ltd.

In the Chancery Division, on April 11, Mr. Justice Maugham heard a petition by the East Kent Gas Company, Ltd., to confirm a reduction of its capital from £350,000 to £209,441.

It was explained by Mr. Vaisey, K.C. (for the Company), that the Company proposed to reduce its capital by returning 8s. on each £1 share and the cancellation of 4s. on each share, bringing the £1 shares to 8s. The Company, he added, was formed for the purpose of supplying gas. It was partly statutory and partly a holding Company with shares in other gas companies, but these had now been sold. The object now was to bring the balance-sheet of the Company into accordance with its activities as were now confined to its statutory obligations. The money to be returned had come from shares sold by the Company.

His Lordship sanctioned the reduction.

Gas Companies' Results in 1932.

Tenby.

At the Annual Meeting of the Tenby Gas Consumers' Company—Mr. E. H. Leach presiding—the Directors recommended a dividend at the rate of 7% for the last half-year, making 7% for the year. They reported that they had completed the purchase of the freehold reversion of the Company's lease from the Tenby Corporation. A resolution was passed approving of the application to the Board of Trade for a Special Order under the Gas Undertakings Acts, 1920 and 1929.

Gas Acts (1920 and 1929) Orders.

SPECIAL ORDERS.

Herne Bay Gas Company, Ltd.

To confer upon the Company further capital powers.

Neath Corporation.

To authorize the Corporation to borrow money, and for other purposes.

Torquay and Paignton Gas Company.

To fix basic prices and dividend, and to make other provisions.

Watford and St. Albans Gas Company.

To provide for the transfer to the Company of the undertaking of the Harpenden District Gas Company.

DECLARATION OF CALORIFIC VALUE.

Coventry Corporation.

As from July 1 the Corporation will supply gas of not less than 480 B.Th.U. within that part of the authorized area of the Corporation for the supply of gas comprising the Kenilworth Gas District, as defined by Section 4 of the Coventry Corporation Act, 1927.

IDEAL HOME EXHIBITION
OLYMPIA
29th March—29th April, 1933
LONDON GAS EXHIBIT
Stand No. 56, Ground Floor, Grand Hall
Call and Inspect all the latest Gas Appliances fixed in the most up-to-date surroundings
THE LONDON GAS EXHIBIT COMMITTEE
84, HORSEFERRY ROAD, S.W. 1
Representing the following London Gas Undertakings:—
The Commercial Gas Company, Harford Street, Stepney, E. 1
The Croydon Gas Company, Katharine Street, Croydon
The Gas Light and Coke Company, Horseferry Road, Westminster, S.W. 1
The South Metropolitan Gas Company, 709, Old Kent Road, S.E. 15
The South Suburban Gas Company, Lower Sydenham, S.E. 26
The Tottenham and District Gas Company, Woodall House, Lordship Lane, Wood Green, N. 22
The Wandsworth & District Gas Company, Fairfield Street, Wandsworth, S.W. 18

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The Stock Exchange closed last week on a note of optimism, and, despite the advent of the holiday, buyers were much in evidence, especially of British Government securities and sound investment stocks. The demand for the latter was well indicated by the result of the issue by J. Lyons & Co., Ltd., of 4% debenture stock at 104, which was nearly nine times over-subscribed. Another satisfactory feature was the welcome advance in British Railway stocks brought about by the better traffic returns and the more hopeful prospects for the future as an outcome of the Salter Report.

The buoyancy in other sections of the House was also reflected in the Gas Market. A large number of transactions were recorded during the four days of opening, and prices of a number of stocks made further improvement. Chief among these were Alliance and Dublin and Uxbridge ordinaries, both of which rose 5 points to 125 and 142½ respectively. British 7% preference also gained 4½ points to 149½; Oriental, Ltd., 4 to 118½; while several others showed smaller gains.

The strength of the present position is illustrated in the following table of some of the larger ordinary issues showing the quotations to-day compared with those for the corresponding weeks of the past two years. It will be remembered that it was not until the latter part of last year that the big change in investment values took place, so that prices of these stocks in April of that year showed little variation either way over those for 1931, but the increase to date over 1932 is in most cases between 25 and 30 points, though British is 40 points up, and Croydon sliding-scale and Tottenham have appreciated 39 points and 39½ respectively.

—	1931.	1932.	1933.
Barnet	126½	127½	155½
Brighton and Hove 5%	103½	110½	143½
Bristol	95	94½	111½
British	111½	109½	149½
Cardiff	97½	94½	110½
Commercial	94½	96½	114½
Croydon sliding-scale	108½	108½	147½
Gas Light £1 units	18s. 6d.	20s. 6d.	25s. 6d.
Liverpool	98⅞	100½	125½
Newcastle £1 units	17s.	17s. 6d	24s. 6d.
Portsmouth 4%	124½	125½	162½
Sheffield	103½	101	120
South Metropolitan	104½	103½	128½
South Suburban	103½	105½	126½
Southampton	78½	76½	109½
Tottenham	104	106	145½
Wandsworth	111½	116½	147½

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *April* 18.

The position in the tar products market is as follows:

Pitch remains quiet, and the price is called about 90s. per ton f.o.b., according to period of shipment.

Creosote is about 2½d. per gallon f.o.b.

Refined tar is about 4d. to 4½d.; pure benzole, about 1s. 11d.; works.

Pure toluole is about 2s. 4d.; pure benzole, about 1s. 11d.; solvent naphtha, 95/160, about 1s. 7s. to 1s. 8d.; and 90/140 pyridine bases, 3s. 6d. to 3s. 9d. per gallon naked at makers' works.

Tar Products in the Provinces.

April 18.

The average prices of gas-works products during the week were: Gas-works tar, 34s. to 39s. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 9d. to 1s. 10d. Coal-tar crude naphtha, in bulk, North, 6d. to 6¼d. Solvent naphtha, naked, North, 1s. 5½d. to 1s. 6d. Heavy naphtha, North, 10d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2¼d. to 2⅜d.; low gravity, 1½d.; Scotland, 2¼d. to 2⅜d. Heavy oils, in bulk, North, 4⅜d. to 5¼d. Carbolic acid, 60's, 2s. 9d. to 2s. 10d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o b. In order to arrive at the f.a s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *April* 15.

Very little change can be recorded in this district. Quotations are reasonably steady, with throughput increasing.

Crude gas-works tar.—The actual value is 42s. 6d. to 47s. 6d. per ton *ex* works.

Pitch.—Values are unchanged at 77s. 6d. to 80s. per ton f.o.b. Glasgow for export, and 80s. to 82s. 6d. per ton *ex* works in bulk for home trade.

Refined tar to Ministry of Transport Specification is leaving the works in larger quantities, and prices range from 3½d. to 3¾d. per gallon, according to quantity.

Creosote oil.—The position is easy with stocks rather high. Values to-day are lower. B.E.S.A. Specification is 2¼d. to 2⅜d. per gallon; low gravity, 2d. to 2⅛d. per gallon; and neutral oil, 2½d. to 2⅝d. per gallon—all in buyers' rail tanks *ex* works.

Cresylic acid.—Prices are irregular, but orders are more numerous. Pale, 97/99%, is 10d. to 11d. per gallon; dark, 97/99%, 9d. to 10d. per gallon; and pale, 99/100%, 1s. 1d. to 1s. 2d. per gallon; all f.o.r. in buyers' packages.

Crude naphtha.—Value is steady at 4½d. to 5d. per gallon, according to quantity and quality.

Solvent naphtha.—90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade 11d. to 1s. per gallon *ex* works.

Motor benzole.—Supplies are low, and 1s. 4d. to 1s. 5d. per gallon in bulk *ex* works is being quoted.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade, 3s. 3d. to 3s. 6d. per gallon

Benzole Prices.

These are considered to be the market prices for benzole at the present time.

	s. d.		s. d.	
Crude benzole	0 10½	to	0 11	per gallon at works
Motor ,,	1 6½	,,	1 7	,, ,, ,,
Pure ,,	1 10	,,	1 11	,, ,, ,,

Contracts Advertised To-Day.

Coal.

Hoylake Urban District Council Gas Department. [p. 178.]
Mansfield Corporation. [p. 178.]

Lime and Acid.

Mansfield Corporation. [p. 178.]

Meters and Repairs.

Mansfield Corporation. [p. 178.]

Retorts.

Skipton Urban District Council Gas Department. [p. 178.]

Tar.

Mansfield Corporation. [p. 178.]

Overseas Opportunities.

[From the Board of Trade Journal.]

Gas Tubes.—H.M. Consul at Danzig reports that a local firm is desirous of receiving quotations for black and galvanized gas tubes ⅛ in. to 2 in. diameter (Ref.: GX. 12445).

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see earlier page.]

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. April 13. (Provincial Exchanges April 12.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week
1,551,868	Stk.	Apl. 3	7⅜	7	Alliance & Dublin Ord. ...	120—130†	+5	124½
374,000	„	Jan. 9	4	4	Do. 4 p.c. Deb. ...	85—95	...	...
557,655	„	Mar. 6	7	7	Barnet Ord. 7 p.c.	153 - 158	...	155—156½
300,000	1	Oct. 17	1/9⅜	1/4⅜	Bombay, Ltd.	24/6 - 26/6	...	...
178,280	Stk.	Feb. 20	9½	9½	Bournemouth sliding scale	195- 205	...	...
550,050	„	„	7	7	Do. 7 p.c. max. ...	157—162	+2½	158½—162
439,160	„	„	6	6	Do. 6 p.c. Pref. ...	137—142	...	...
50,000	„	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
162,025	„	„	4	4	Do. 4 p.c. Deb. ...	101—106	...	...
210,000	„	„	5	5	Do. 5 p.c. Deb. ...	122—127	...	126½
357,900	„	Mar. 6	7½	7½	Brighton, &c. 6 p.c. Con. ...	152 - 157	...	152½—156½
540,000	„	„	6⅔	6⅔	Do. 5 p.c. Con. ...	141—146	...	...
195,500	„	„	6	6	Do. 6 p.c. B Pref.	133—143	...	137½—138⅔
1,487,500	„	Mar. 6	5	5	Bristol 5 p.c. max.	111—112*a*	...	...
120,420	„	Dec. 19	4	4	Do. 1st 4 p.c. Deb. ...	100½—101¼*a*	...	...
217,870	„	„	4	4	Do. 2nd 4 p.c. Deb. ...	100½—101¼*a*	...	...
328,790	„	„	5	5	Do. 5 p.c. Deb.	120—124*a*	...	...
855,000	„	Apl. 3	7	8	British Ord.	147—152*	...	...
100,000	„	Dec. 19	7	7	Do. 7 p.c. Pref.	147—152	+4½	...
350,000	„	„	—	5⅔	Do. 5⅔ p.c. Pref. ...	105—110	...	...
120,000	„	„	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	„	„	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	„	Jan. 9	5	5	Cambridge 5 p.c. Deb. ...	117—122	...	...
100,000	10	Dec. 5	6	6	Cape Town, Ltd.	7⅞—8⅛	...	...
100,000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	...
150,000	Stk.	Dec. 19	4½	4½	Do. 4½ p.c. Deb. ...	88—93	...	...
626,860	„	Feb. 20	6	6	Cardiff Con. Ord.	108—113	...	...
237,860	„	Jan. 9	2½	5	Do. 5 p.c. Red. Deb.	105—110	...	...
157,150	„	Feb. 20	5	6½	Chester 5 p.c. Ord.	97—102*b*	...	...
98,936	1	Oct. 17	2/-	2/-	Colombo, Ltd. Ord.... ...	25/—30/-	...	...
24,500	1	Oct. 17	1/4⅜	1/4⅜	Do. 7 p.c. Pref. ...	19/—21/-	...	...
609,204	1	Mar. 20	/11'48	/11'48	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	17/—18/-
296,053	1	„	1/3'30	1/3'30	Do. 8 p.c. Pref.	19/—21/-	...	...
1,796,955	Stk.	Feb. 20	5	6½	Commercial Ord.	112—117	...	...
475,000	„	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
265,272	„	Mar. 6	—	5	Do. 5 p.c. Deb. ...	120—125	...	122½
807,560	„	Feb. 20	7	7	Croydon sliding scale ...	145—150	...	148—149
469,590	„	„	5	5	Do. max. div.	101—106	...	...
500,000	„	Jan. 9	5	5	Do. 5 p.c. Deb.	120—125	+1	123—125
542,270	„	Mar. 6	7	10	Derby Con.	150—160*c*	...	...
55,000	„	Jan. 9	4	4	Do. 4 p.c. Deb. ...	80—85*c*	...	...
209,000	„	Mar. 6	5	5	East Hull Ord. 5 p.c. ...	100—105	...	...
179,500	„	Mar. 6	6	6	East Surrey Ord. 5 p.c. ...	120 - 125	+2	123½
155,019	„	Dec. 19	5	5	Do. 5 p.c. Deb. ...	117—122	...	122
1,002,180	„	Apl. 3	15	17	European, Ltd.	133—138*	...	135
19,373,992	„	Feb. 20	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	25/—26/-*f*	...	25/6—25/10½
2,600,000	„	„	3⅜	3⅜	Do. 3⅜ p.c. max. ...	85—89	+⅛	88—88⅜
4,477,106	„	„	4	4	Do. 4 p.c. Con. Pref. ...	102—105	...	102½—104
6,102,497	„	Dec. 19	3	3	Do. 3 p.c. Con. Deb. ...	80—83	...	81⅛—81⅝
3,642,770	„	„	5	5	Do. 5 p.c. Red. Deb. ...	115—118	...	116⅛—117½
3,500,000	„	„	4½	4½	Do. 4½ p.c. Red. Deb. ...	111—114	...	112—112⅝
270,466	„	Mar. 6	6	6	Harrogate New Cons. ...	113—118	...	...
82,500	„	Mar. 6	7	7	Hastings & St. L. 5 p.c. Conv.	138—143	...	...
258,740	„	„	5⅛	5⅛	Do. 3⅛ p.c. Conv.	110—115	...	114⅛
70,000	10	Oct. 17	10	10	Hongkong & China, Ltd. ...	12 13	...	...
213,200	Stk.	Mar. 6	6	6	Hornsey Con. 3½ p.c. ...	122—127	...	...
5,600,000	„	Nov. 21	14	10	Imperial Continental Cap.	202—212	...	207⅛—209½
223,130	„	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb.	89—94	...	...
235,242	„	Mar. 6	8⅝	8⅝	Lea Bridge 5 p.c. Ord. ...	170—175	...	174
2,145,907	„	Mar. 6	6	6	Liverpool 5 p.c. Ord. ...	125—126*h*	...	...
245,500	„	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	105—115*b*	...	...
306,088	„	Jan. 19	4	4	Do. 4 p.c. Deb. ...	101—103*b*	...	...
165,736	„	Feb. 20	8	10	Maidstone 5 p.c. Cap. ...	180—200	...	...
56,176	„	Dec. 19	3	3	Do. 3 p.c. Deb. ...	70—75	+2	71½
75,000	5	Dec. 5	10	10	Malta & Mediterranean ...	8⅛—10⅛	...	...
392,000	—	Apl. 1	5⅛	5⅛	Metropolitan (of Melbourne) 5⅛ p.c. Red. Deb.	98—103*	...	...
231,978	Stk.	Mar. 6	5	5	M. S. Utility "C." Cons. ...	103—108	...	108
818,657	„	„	4	4	Do. 4 p.c. Cons. Pref.	92—97	...	...
112,126	„	Jan. 9	4	4	Do. 4 p.c. Deb. ...	102—104	...	103⅜
148,955	„	„	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
675,000	„	21 May '31	16	16	Montevideo, Ltd.	35—45	...	40
2,061,315	„	Mar. 6	5	5⅔	Newcastle & Gateshead Con.	24/3—25/3*d*	+/3	...
682,856	„	„	4	4	Do. 4 p.c. Pref. ...	100—102*d*	...	...
776,706	„	Jan. 9	3⅛	3⅛	Do. 3⅛ p.c. Deb. ...	91—92*d*	+1	...
277,285	„	Nov. 7	5	5	Do. 5 p.c. Deb. '43...	107—109*d*	...	...
274,000	„	Feb. 20	5	5	Newport (Mon.) 5 p.c. max.	99—101*a*	...	...
204,940	„	Mar. 20	7½	7½	North Middlesex 6 p.c. Con.	132—142	...	...
396,160	„	Feb. 6	5	5	Northampton 5 p.c. max. ...	98—103	...	...
300,000	„	Dec. 5	7	9	Oriental, Ltd.	116—121	+4	120
205,162	„	Dec. 19	8	8	Plym'th & Stonehouse 5 p.c.	155—165	...	160
504,416	„	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std.	160 165	...	163½
241,446	„	„	5	5	Do. 5 p.c. max. ...	102—107	...	...
114,000	„	Feb. 20	5	5	Preston 5 p.c. Pref.	103—108	...	...
686,312	„	Jan. 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	82—87	...	...
389,813	„	Dec. 19	4	4	Do. 4 p.c. Cons. Deb.	82—87	...	...
150,000	10	Mar. 20	6	6	San Paulo 6 p.c. Pref. ...	6⅞—7⅛	...	...
1,736,968	Stk.	Sept. 5	6	6	Sheffield Cons.	119—121*e*	...	...
95,000	„	Jan. 9	4	4	Do. 4 p.c. Deb.	91—95*c*	...	...
133,201	„	Feb. 20	8½	5	Shrewsbury 5 p.c. Ord. ...	125—130	...	...
90,000	10	June 6	15	15	South African	3—5	...	...
6,709,895	Stk.	Feb. 20	5	7	South Met. Ord.	127—130	...	128½—129½
1,135,812	„	„	6	6	Do. 6 p.c. Irred. Pf.	138—143	...	141⅛
850,000	„	„	—	20/-*g*	Do. 4 p.c. Irred. Pf.	100—104	...	102—104
1,895,445	„	Jan. 9	3	3	Do. 3 p.c. Deb. ...	80—83	...	81
1 000,000	„	Jan. 23	5	5	Do. 5 p.c. Red. Deb.	114—117	...	114½
209,820	„	Mar. 6	8½	8½	South Shields Con.	147½—152½*d*	...	...
1,543,795	„	Feb. 20	6	6	South Suburban Ord. 5 p.c.	124—129	...	129
300,000	„	„	5	5	Do. 5 p.c. Pref.	113—118	+1	116—117
868,837	„	Dec. 19	5	5	Do. 5 p.c. Deb.	120—125	...	...
647,740	„	Feb. 20	5	5	Southampt'n Ord. 5 p.c. max.	107—112	...	110
121,275	„	Dec. 19	4	4	Do. 4 p.c. Deb.	100—105	...	...
350,000	„	Mar. 6	9/-	5½	Swansea 5½ p.c. Red. Pref.	108—112	...	...
200,000	„	Dec. 19	6½	6½	Do. 6½ p.c. Red. Deb.	105—110	...	...
1,076,490	„	Mar. 6	6⅔	6⅔	Tottenham and District Ord.	142—147	...	144⅛
300,000	„	„	5⅛	5⅛	Do. 5⅛ p.c. Pref. ...	118—123	...	...
199,005	„	Dec. 19	4	4	Do. 4 p.c. Deb. ...	98—103	...	...
85,701	„	Apl. 3	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	80—85*	...	...
347,769	„	Mar. 6	7	7	Uxbridge, &c., 5 p.ct. ...	140—145	+5	142—144
88,330	„	„	5	5	Do. 5 p.c. Pref. ...	108—113	...	...
1,322,220	„	Mar 6	7	7	Wandsworth Consolidated	145—150	+3	147—149
1,096,373	„	„	5	5	Do. 5 p.c. Pref.	112—117	...	...
1,317,964	„	Dec. 19	5	5	Do. 5 p.c. Deb.	120—125	...	121½—123½
158,400	„	Mar 6	5	6A	Winchester W. & G. 5p.c. Con.	105—110	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g.*—For quarter. *h.*—Paid £3. including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

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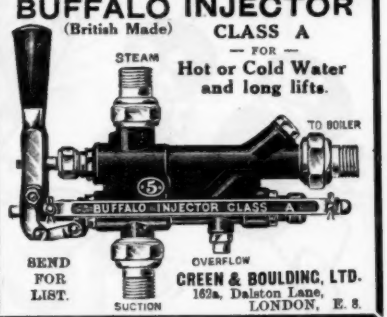

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THE·PARADE·OF·THE·THERMS

"Show a leg there!" See these little chaps "jump to it" at the bugle's blast. Therms work day and night and Sergt. A. E. M. Meters is on parade twenty-four hours a day. He is alert at all times and proficient in all capacities—*don't his therms know it!* Entrust *your* therms to Sergt. A. E. M. Meters and be sure that every one is checked up and paid for.

"A. E. M." DUAL COIN METERS

To alter the new "A. E. M." Dual Coin Meter from 1d. to 1/- only one operation is called for. By adjusting a brass sleeve behind the coin range plate, the coin pocket and the mechanism behind are simultaneously adjusted. There is accordingly no risk of the consumers getting a shilling's worth of gas for a penny or vice versa.

ALDER & MACKAY LIMITED

MAKE METERS OF METICULOUS MEASUREMENT

ALDER & MACKAY LTD., EDINBURGH, LONDON & BRANCHES.

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TO CORRESPONDENTS: No notice can be taken of anonymous communications, unless authenticated by the name and address of the writer (not necessarily for publication).

TO ADVERTISERS.

NOON ON TUESDAY is the latest hour for receipt of advertisement copy for the following day's issue.

FIRST POST ON MONDAY is the latest for receipt of alterations of standing advertisements.

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Full Schedule of Advertising Rates on application.

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United Kingdom and Ireland	Advance Rate	35/- per annum. 18/- per half year.
	Credit Rate	40 - per annum 21 - per half year.
Dominions and Colonies ...		35/- per annum, in advance.
United States (through United States Agent)		$8.50 per annum, in advance.
Other Countries in the Postal Union.		40/- per annum, in advance.

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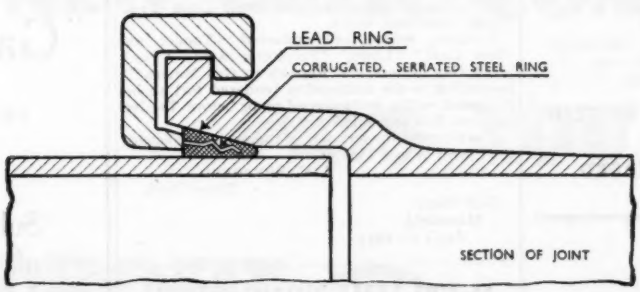

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THE Gas Committee of the Mansfield Corporation invite TENDERS for the following:

(*a*) Supply of SCREENED GAS COAL or COBBLES.
(*b*) Supply of LIME.
(*c*) Supply of SULPHURIC ACID.
(*d*) Purchase of SURPLUS TAR.
(*e*) Supply of NEW GAS METERS.
(*f*) Repair of GAS METERS.

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It will be a Condition of the Contract that the Standard Rate of Wages and Conditions of Labour prevailing in the district shall be observed.

Particulars may be obtained on application to Mr. James Gibson, Gas Engineer, Lime Tree Place, Mansfield, Notts.

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The Corporation do not bind themselves to accept the lowest or any Tender.

A. C. SHEPHERD,
Town Clerk.

Carr Bank,
Mansfield,
April 18, 1933.

SKIPTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

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THE Gas Committee of the above Council invite TENDERS for the RENEWAL of ONE HORIZONTAL SETTING of EIGHT RETORTS, from Stage Floor only.

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The Council do not bind themselves to accept the lowest or any Tender.

J. P. HORNE,
Clerk to the Council.

April 13, 1933.

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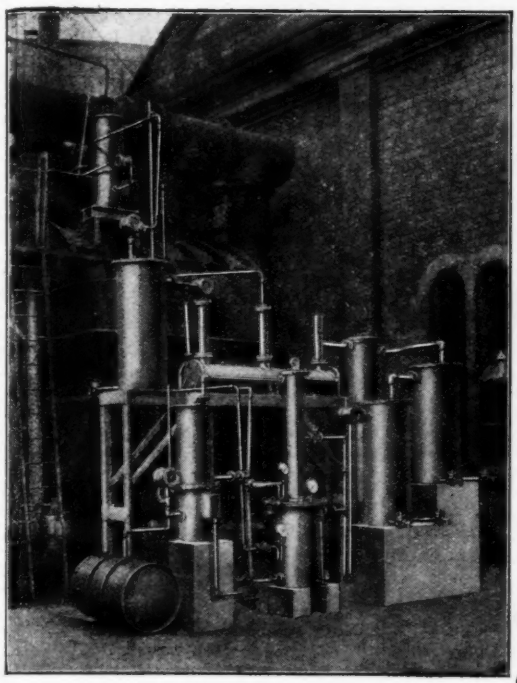

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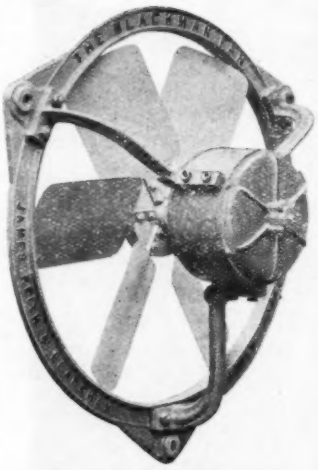

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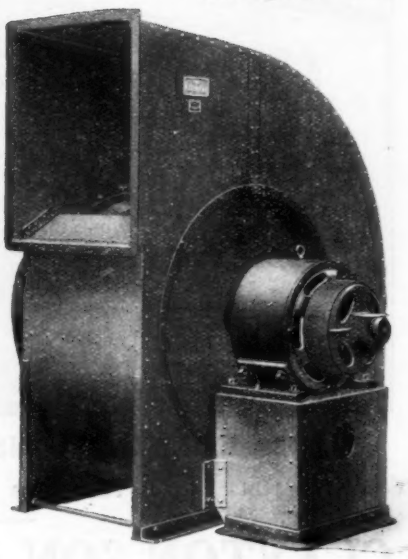

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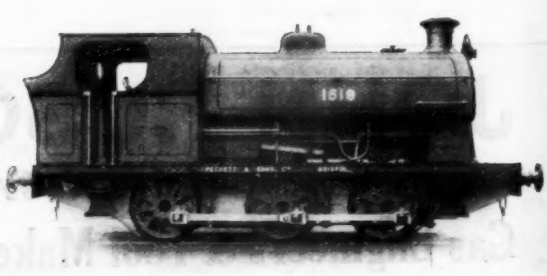

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